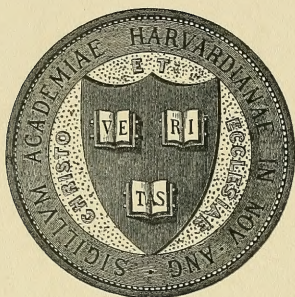


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The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first was *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July, and August. Its scope is the publication of the results of original research in all departments of Natural History.



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Big Horn Ram's Head.

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No. 1

"In the spirit of science discussion is free, and each man desires to impart what he knows, instead of concealing it from motives of 'policy'."—PROFESSOR T. D. A. COCKEREL.

A FOREWORD FOR 1928.

In order to stimulate interest in the vast and little known domain of Northern Canada, the late Sir William Price offered a prize of \$1,000 for the best paper dealing with its geography and natural resources. Through the generosity of his heirs, THE CANADIAN FIELD-NATURALIST has been able to arrange for the publication in its pages of the manuscript to which this prize was awarded in a Canada-wide competition. This manuscript, which bears the title of CANADA NORTH OF 56°, will appear in an early number of THE NATURALIST. It is well illustrated and is the work of an author who has a personal knowledge of sub-arctic North America and Greenland. No Canadian who wishes to be well informed on the geography of his country's higher latitudes and on their part in future national development can afford to miss this excellent article.

We believe that this and other special contributions to THE NATURALIST will greatly increase public interest in the activities of The Ottawa Field Naturalists' Club and enable members to celebrate the Club's fiftieth year by doubling its membership and its sphere of usefulness.—EDITOR.



CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF NORTH-EASTERN LABRADOR

By BERNARD HANTZSCH

"Beitrag zur Kenntnis der Vogelwelt des nordoestlichsten Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechshundfünfzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July, 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II. Besonderer Teil (Detailed Part), pages 307-392.

(Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.)

(BIOGRAPHICAL NOTE.—BERNHARD ADOLF HANTZSCH was born in Dresden, Saxony, January 12, 1875, and graduated from the normal school of his native city, after which he followed the profession of teacher for several years, devoting his spare time and vacations to the study of ornithology. He made various excursions in Saxony, Slavonia, and Bulgaria, and among several papers on European birds prepared a "Catalogue of the Species of Birds Observed in the Kingdom of Saxony," which was issued by the Ornithological Society of Dresden in 1903. In 1903 he spent nearly five months in Iceland, collecting specimens and notes which resulted in "Contribution to the Knowledge of the Avifauna of Iceland" ("Beitrag zur Kenntnis der Vogelwelt Islands"), Berlin, 1904. Hantzsch's expedition to Labrador in 1906, an account of which is here presented, was followed by a more extended expedition to Baffin Island. He was landed in Cumberland Sound in the summer of 1909, after losing most of his stores by shipwreck. In the early spring of 1910, Hantzsch travelled by sledge with some Eskimos to Nettilling Lake in the interior of Baffin Island, spent the summer collecting in that district and descended the Koudjuak River, reaching the eastern coast of Foxe Basin on September 20, 1910, being the first white man to cross the middle of Baffin Island. After a winter of hardship and privation in an almost gameless country, his party explored and mapped the unknown coast of Foxe Basin for about 267 miles north of the mouth of Koudjuak River. They suffered much from starvation and sickness, and Hantzsch died on the return trip about the first of June, 1911, and was buried on the shores of Foxe Basin

by the bay which he discovered. His Eskimo companions brought out his field notes and collections of birds, eggs, and mammals, and they came to Royal Zoological Museum at Berlin. The zoological and anthropological collections made by Hantzsch on his Labrador expedition and most of his Iceland specimens were acquired by the Royal Zoological and Anthropological Museums at Dresden.

Hantzsch's "Ornithological Journal. Observations during a Journey in Baffin Island" ("Ornithologische Tagebuch. Aufzeichnungen während einer Reise in Baffinland"), were first published in *Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin*, April 21, 1914, No. 4, pp. 129-165 and were later reprinted in *Journal für Ornithologie*, Volume 63, No. 2, 1915, pp. 137-228, under the title, "Bernhard Hantzsch's Ornithological Results in Baffin Island" ("Bernard Hantzsch's ornithologische Ausbeute in Baffinland"), by Dr. Erich Hesse, who compared Hantzsch's specimens with other museum material, and added technical and critical discussions of the skins and eggs, including measurements of most of the 675 birds' eggs in the collection. Hantzsch's "Observations on the Mammals of Baffin Island" ("Beobachtungen über die Säugetiere von Baffinland") were published in *Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin*, 1913, No. 2, with an introduction by P. Matschie, pp. 141-160, figs. 1-10. Hantzsch's works, printed in German only, and in part issued during the Great War, have been unavailable to most naturalists on this side and have been generally overlooked. His writings bear the evidence of careful, painstaking work, dogged persistence, keen powers of observation, and no little literary skill in depicting bird life. Hantzsch's works on Labrador and Baffin Island form important contributions to a little known field of Canadian ornithology on which virtually nothing has been published since his time, and will always be important as the records of a pioneer naturalist.—R. M. ANDERSON).

I. GENERAL PART.



FILLED with desire to again advance the knowledge of the northern avifauna by investigations on the spot, the choice of a goal accessible to me at the present time was not easy. Iceland, the interesting avifauna of which I investigated in 1903 and later described,¹ was out of the question for further researches so far as I was concerned, since as early as 1905 Denmark had sent to that place for four years a zoologist, Mr. Hörring, Master of Science, who was also to obtain rather accurate results in the ornithological field. In Greenland, as far as can be obtained in ordinary circumstances, much has been done on the part of the Danes toward the investigation of the avifauna.

For pecuniary reasons, I had to refrain from a visit to inhabited regions, perhaps with exception of Spitzbergen, which to-day is not very difficult to reach. The whole of northern Asia, too, which may still conceal so many secrets from the ornithologist, was neither advisable, nor perhaps even possible owing to the disorders prevailing in the Russian Empire.

My attention therefore turned toward Arctic America, which ornithologically has been only slightly investigated, and where the German has little to fear from the English and American owners respectively, and can be certain he will not be hindered in his studies, and may indeed be fairly sure of help. Really thorough ornithological results in those inhospitable regions (p. 378) beyond the limits of the forest can be obtained only over a sojourn of several years. Every expedition demands a length of time which cannot be determined before setting out, and the climatic conditions of different years are so varied that no satisfactory judgment concerning the circumstances dependent on these climatic phenomena may be reached in a single winter in a district.

A successful piece of work in those hardly accessible regions requires thorough theoretical and practical preparation. For this reason I decided first of all to make the acquaintance of conditions there as much as possible from my own observations. The locality most favourable for my purposes, which I could work in a stay of ten weeks or so, was the newly-founded mission station Killinek (Port Burwell) in the northeast of Ungava Bay (Labrador). I suspected that even if the resident avifauna there were not abundant, the migration would be interesting because of the geographical location.

I carried out this preliminary journey in the year 1906, and, as it appears of importance for

ornithological readers, shall sketch its history. Communication with northern Labrador by boat is rare and uncertain. Furnished with a kind recommendation by the mission board of directors of the Moravian Brethren of Berthelsdorf at Herrnhut in Saxony, permission was granted me in London by the Society for the Furtherance of the Gospel amongst the Heathen, to make use of the mission steamer *Harmony*, under command of Captain J. E. Jackson, from London to Labrador and thence to Newfoundland.

My fortnight's stay at the point of departure was passed in examining zoological, especially ornithological collections, in visiting the Zoological Gardens, and in association with English ornithologists, and German ornithologists living in England. Above all, I was accorded generous hospitality in the homes of the venerable Newton in Cambridge, the much-experienced Dresser in London, and the excellent Hartert in Tring.

On July 2nd the *Harmony* left the London docks and was soon in the open Atlantic. After land vanished we observed no birds worthy of particular notice up to July 11th; from that time on, however, we had such almost constantly in our vicinity.

Countless Greater Shearwaters (grosse Sturm-taucher), *Puffinus gravis*, enlivened the journey from latitude $52\frac{1}{2}^{\circ}$ North and longitude $23\frac{1}{2}^{\circ}$ West of Greenwich as far as perhaps latitude 58° North and longitude 51° West. South of Greenland, especially in the neighbourhood of the ice, (p. 179) flocks of twenty or more birds sat gregariously on the water. There were also some that flew about one another in playful fashion, then scattered again across the wide stretch of water. It was apparent that among these hundreds of birds were individuals of different ages, which spent the time between the breeding seasons far from their breeding places, probably on the Southern Hemisphere, a thing which is known to take place annually. My attempts to capture some of the creatures by means of a fishing-hook concealed in fat on a long string were futile, since in spite of the prevailing adverse winds our ship continued to travel too fast for measures of this kind, and the birds apparently found plenty of food elsewhere. At least they followed our little vessel only seldom, and almost never by day.

For the lonely traveller on those rough expanses of ocean it is a special pleasure to look at the flight of the active but not very swift birds and to observe how they glide close over the waves with the long wings beating evenly. This Shearwater species is also characterized by the frequent turnings of the body, which indicate changes in flight direction and are carried out

¹Contribution to the Knowledge of the Avifauna of Iceland (Beitrag zur Kenntnis der Vogelwelt Islands, Friedlander & Sohn, Berlin, 1905.)

during the soaring. The bird lays itself so far on the side to which it leans that the whole lower part of the body becomes clearly visible. If the weather is quiet and sunny, the Shearwaters often sit for hours on the ocean, sleep, clean their plumage, and also bathe many times after the manner of other swimming birds, ducking down into the water and then raising the upper part of the body high up. I did not often see the birds dive, and then only for a few seconds. The birds become particularly active towards evening; indeed they are active through the whole summer night, whisk past the ship, ghostlike in shadowy illusion, and their voices are heard more frequently than by day. The voice is a short, sharp *Guit, kwitt, kwatt*, which now and then was rapidly uttered many times in succession. The only additional species of Shearwater observed were some individuals of the dark *Puffinus griseus stricklandi*.²

From July 1st on, when we were at about latitude 55° 18' North, longitude 28° West, appeared the first Fulmars (*Eissturmvogel*), *Fulmarus glacialis*, which became our constant visitors. During the first days only specimens with white underbody showed themselves; after July 17th, however, the rather uniformly coloured bluish-gray variety appeared also. At first these were seen only now and then among the light individuals and were noticeably much shyer than the ordinary colour phase. The creatures followed the ship, mostly at a great distance, coming hesitatingly nearer whenever we threw on the water pieces of fat and meat (p. 180) for which the light-coloured specimens plunged vigorously. Later, birds in the dark colour phase increased in number, and in the vicinity of Hudson Strait it was often observed that these were the only ones flying about the ship.

I never grew tired of watching for many hours long, day by day, the movements of these birds, so bulky and phlegmatic in appearance, yet so skilled in flight. They fly for the most part close to the water, the wings moving rather quickly; then usually follows a little wheeling which is carried out as they soar. In settling on the water, as they do especially whenever one feeds them, they extend forward the outspread feet which are at other times carried stretched out naturally behind them. In quick swimming they paddle with their feet alternately, as is recognized by the movement of the back part of the body this way and that. They dive from

the swimming position to get sinking pieces of meat, but not, however, directly from the air. The birds do not display their perfect adroitness of flight except in stormy weather. Then they rise higher over the water, even considerably above the height of the ship's mast, and glide soaring through the air, something they cannot do in calm weather. Even if the gale drives across the surging sea with raging force, and the ship flying before it is overtaken by the dark, roaring waves, our bird outrides the storm. Silently and without a beat of the wings he circles the vessel, turning and soaring, the individual wing- and tail-feathers unfold in their independent flexibility in complete mastery and with even the legs as far as the toes continuously in action. And when this artist in flight, so appropriately named *Eis-Sturmvogel* [literally, Ice Storm-bird], is at last tired out, he lets himself be carried up hill and down upon the waves, without being bothered very much if the water, plunging down from the foam and carried through the air, spills over him occasionally.

The specimens observed on the open ocean might have been chiefly rather young creatures, not yet capable of breeding, as a female caught on July 16th with the angling-line indicated. This one had moulted rather early, but in the body plumage there were still pin-feathers. It was not fat. The green-walled stomach contained merely some small granules looking like fish-spawn, a few small pieces of shell, and little sharp-cornered stones, on account of which the captured bird even when handled did not bring forth from the bill the least quantity of oily fluid. If we threw fat pieces of meat into the water, very soon Fulmars came near the ship, even if at the moment none had been in sight. Now and then on such occasions (p. 181) 40 to 50 individuals assembled in a short time over our wake, soon scattering again when we stopped feeding. Each one tried to reach the morsel as quickly as possible, whereupon birds swimming close to one another now and then uttered a hoarse cackling. In general, however, they were quite friendly. When we came near the land the number of birds became far less, though now and then scattered individuals appeared as we were closely beset by the ice.

Petrels (*Sturmschwalben*) were observed only a few times from the ship; a single specimen on July 14th, the species of which could not be determined, and another on the evening of July 18th. On that day a southwest wind blew, which increased on the 19th to a heavy southeast storm. The second bird was identified certainly as *Oceanodroma leucorhoa* [Leach Petrel]. Late in

²The 16th Supplement of The American Ornithologists' Union Check-List of N. A. Birds, *Auk*, 1912, does not recognize this sub-species; and the name *Puffinus griseus* (Gmelin) is replaced by *Puffinus carneipes* Gould.—R.M.A.

the evening of July 20th, six or seven specimens of the same species appeared in a gentle north-west wind, and accompanied the ship until far into the night. We were then between Greenland and northeast Labrador. The butterfly-like fluttering flight of this species, which reminds one of the flight of the Sand-martin (*Uferschwalbe*) *Riparia*, is exceedingly light, dainty, and dexterous. The bird quickly rises some meters above the water, then flutters downward again, hovers for a time close above the waves, and then begins anew its fluttering ascent. For hours on July 20th I observed the light forms, which often swept past me at scarcely more than two or three meters distance. It was a wonderful clear night. The northern sky at the horizon sent up rays of light in a splendid red, that shaded off into a delicate green out of which small, dark clouds projected in sharp contrast, passing at last into the dark blue of the firmament. It was the right time for the Petrels, which are much more quiet in the daytime, and they fluttered about joyously in light play. Almost continuously the creatures sound their cries, which it is true can not be heard far. They consisted of pleasant, swallow-like, twittering syllables, which sounded somewhat sharp, but vigorous and lively. They were usually uttered quickly several times, one after another, just as one speaks quickly. I noted *pitiripit*, *pitipit*, *quititu*, *quatequiti*, *quetetetet*. Occasionally one heard only monosyllabic sounds, at other times, rather long tropes. When the company fluttered close to one another, the mingling of the different calls formed quite a merry twittering.

Of other species of birds only a few were observed on the open ocean. On July 18th, two *Sterna macroura* Naum. [= *Sterna paradisæa* Brünnich, Arctic Tern] flew about the masts of the ship, vanishing again very soon, however, in the face of the gentle southwest wind. At different times scattered Jaegers [Raubmöven, lit., "Robber-gulls,"] of all three smaller species, as far as determinable with certainty, *Stercorarius parasiticus* [Parasitic Jaeger] the most abundant (p. 182) from July 20th on, when we were still perhaps 150 nautical miles distant from land. Also smaller flocks of *Uria lomvia* [Brünnich Murre], which flew about the vessel quite briskly in a wide arch. On July 22nd, a flock of 20 to 25 rather large, red-bellied and dark-billed Sandpipers (Strandläufer) apparently *Tringa canutus* [the Knot, now *Calidris canutus* Linnæus of A.O. U. Check-list] flew past us in a gentle southwest wind.

In the late evening of July 21st we sighted the first moving ice-floes. On the next morning and

forenoon the ship had to break through a broad girdle of ice in order to reach open water again toward the east. Dense fog, wind, rain and ice hindered observation during the next day so that we waited for clearer weather, sailing quite slowly, stopping, apparently drifting with the currents. Land was sighted on the evening of July 24th, rather near, the higher portions, however, being entirely veiled in fog. Because no kind of astronomical observation could be made for days, we proceeded the next morning towards the coast discovered to the northward, and recognized that we must be near Resolution Island (southeastern Baffin Island). This became a certainty with the appearance of the sun. When in the distance the snow-covered heights of Loks Land appeared at the northern end of Frobisher Bay, we turned around and journeyed south to the coast, rather free of ice, towards Hudson Strait.

Resolution Island is not continuously inhabited, but is visited during some years by occasional Eskimo families of the neighbouring districts, on account of its driftwood and abundance of bird life. The northerly east coast, along which we sailed, shows many low islands stretched out in front of it, partly covered with abundant heather growth and at the time of migration may offer to the land birds, especially Ptarmigan (Schneehühnern), an excellent haunt. The sea was populated by birds, far more abundantly than in northeastern Labrador.

Great masses of *Uria lomvia* [Brünnich Murre] lay on the water or flew toward the land, characteristically in a line one behind another. Very frequent also were Eider ducks, *Somateria mollissima*; several times flocks of 40 to 50 drakes flew past. Graceful Kittiwakes (Dreizehnmöven) *Rissa*, fluttered about over the water. With the exception of numerous Murres (Lummen), these birds were breeding on a dome-shaped island on the coast a little south of Cape Black Bluff which attracted attention for a great distance by its fresh growth of grass. The birds seemed to have already hatched their young, and flew around the rock like a swarm of bees. Larger gulls also inhabited the neighbourhood, but only *Larus glaucus* [*Larus hyperboreus* Gunnerus, Glaucous Gull] and *argentatus smithsonianus* [*Larus argentatus* Pontoppidan, Herring Gull; the American subspecies *smithsonianus* is no longer recognized by the A.O.U.] could be determined with certainty. Of the Jaegers, one *Stercorarius pomarinus* [Pomarine Jaeger] and some adult *longicaudus* [Long-tailed Jaeger] showed themselves. Of *Fulmarus* only a few individuals of the dark variety were observed here. *Cephus*

grylle mandti [Mandt Guillemot]³, as in former days, liked to stay near the ice. Other species could not (p. 183) be determined with certainty, nor to what extent the ones named breed on the island, though the majority of them should do so.

In the evening in Hudson Strait, we again came into the ice, which beset us closely many times up to August 4th, then let us go free a little. We were driven about between Resolution Island, Meta Incognita, Akpatok, and the northeast of Ungava Bay, and passed days of danger and anxiety, as well as some of splendid, enchanting beauty. Often, especially at night, our ship barely escaped the mighty icebergs moved quickly by storm and current. Some times its whole hull groaned heavily in the embrace of drift ice pressed strongly against the planks by the whirling waves and changing tides. At other times we sat on the deck in the quiet midday hour in the smiling sunshine and gazed toward the land lying there in remarkable mirage, the goal of our wishes separated from us by a vast field of white, green, and blue ice-cakes which moved continually here and there, pushing through each other and carrying us along with them. Or we gazed at the setting sun, which reflected in magic fashion the most wonderful dark colour tones on the large and small surfaces of water between the floes. Then perhaps a little pair of Black Guillemots (*Gryll-Lummen*) played confidently near the ship, or some Thick-billed Guillemots (*Dick-schnabel-Lummen*) diving, disappeared in the water for minutes at a time in search of fish for their supper. And a lonely Glaucous Gull (*Eismöve*) flew far overhead in the air toward the land. How I should have liked to accompany it! How beautiful it was too, in the midst of the ice. Most of the species of birds which we observed on the coast of Resolution Island, also showed themselves here in our neighbourhood as soon as open water appeared. Several times I observed farther away, *Tringa canutus* [Knot,] *Crymophilus fulicarius* [Red Phalarope], *Phalaropus lobatus* [Northern Phalarope], and twice, an almost completely white *Larus leucopterus* [Iceland Gull]. In the one case the individual settled down on a point of ice near the ship, enabling me to identify it with certainty. This I could not do with other medium-sized gulls with light wings, and a hunt for the birds was impossible on account of the unsteady and moving ice, which only in a few cases permitted us to leave the ship on foot or by boat.

On the 4th of August the ice between us and the land appeared somewhat less dense, and since

we had coal for only one day more, and were daily drifting about 40 nautical miles northward, the breach had to be forced with the expenditure of the greatest energy and wisdom on the part of the captain and his crew. Bravely the ship fought against the masses of ice, every small crack, every loose place between the cakes was made use of; here and there, however, (p. 184) where a passage was entirely closed, the ice had to be pushed aside with full steam and be broken into bits. At last, after perhaps fifteen hours of heavy battle, the victory was won, and we sailed into open water. How proudly now our good ship, which was unharmed, thrust its way toward the land after this accomplishment, which seemed to us as a release. How joyously I looked at the swarms of yellow-brown and white *Larus glaucus* [Glaucous Gulls] which settled down for the evening's rest on the few ice-cakes still pushing around. In the quiet, dream-like breeze we sailed at about 9 o'clock into the harbour of Killinek (Port Burwell), which was still filled with ice. A short time later the first black-haired Eskimos ascended to the deck where I stood surveying the lonely, rocky chain of hills which were to represent my field of observation and which beckoned a greeting to me in deep, awful solemnity, yet also in unending friendliness.

My life in Killinek turned out to be simple, but to me pleasant in the highest degree. A mission has been carried on for two years among the Eskimos there—about eighty in number and in the main still heathen—and I received from the missionaries, Herr Waldman, a German, and Mr. Perrett, an Englishman, and from their charming wives, willing advice and assistance. I can not refrain from expressing to them also in this place my sincere thanks for all the many services given to me personally and to my work.

For the time of my stay at the post half of a small, wooden house was given over to me, and there I passed several very happy weeks, in the midst of the singular natural surroundings. In the heathen Paksau, an excellent man about 30 years old, I found a dependable and clever companion, if indeed a somewhat stubborn one, who also helped me in the preparation of the abundant catch of birds.

Travelling in those districts, as will appear more clearly from the descriptions of the different forms of the landscape, is difficult. Since only a few Eskimo families are to be found on the whole east coast of Ungava Bay between Killinek and George River, and since along the Labrador coast as far as Aulatsivik, somewhat north of Nachvak, human dwellings are still more rare, the only possibility for the collecting naturalist

³*Cephus mandti* (Mandt) is still carried in the A.O.U. Check-List as a distinct species from *C. grylle* (Linn.)—R.M.A.

is to depend upon himself and a constant companion to journey along the coast by boat, carrying tent, sleeping-bag, and preserved food supplies, together with all other necessary articles, to favourable places on the coast where driftwood and fresh water are to be found, and from such bases conducting little excursions into the interior. A more thorough investigation of the districts which lie farther removed from the coast would be possible only along navigable rivers (p. 185), of which there is not a single one in northeastern Labrador, or with sleds, as long as the snow is on the ground. The exploration of larger lake districts in the interior, which are to be sure of great promise zoologically, may be carried out only by spending the summer in the respective districts, for which much time and considerable financial resources are required. My short sojourn forced me in all cases to proceed along the coast by boat, whenever it was not a matter of one day or still shorter excursions. Rather long expeditions of this kind, up to nine days, took me down into Ungava Bay as far as Takpangajok Inlet, as well as upon the east coast of Labrador, where I found opposite the mighty Kakkeviak a group of islands, the largest of which I called

"New Plauen" ("Neu-Plauen") in honour of my native dwelling-place. In all my communications which follow I confine myself to these extreme districts of northeastern Labrador, let us say the land north of $59^{\circ} 30'$, of which, between the critical survey of the existing literature⁴ and the verbal accounts of the inhabitants, I shall give an ornithological picture. That this is necessarily incomplete in many respects, I hope to prove through later contributions from those regions themselves. After all, the knowledge of the characteristic representatives of the avifauna ought to be more important than an account of all the rare appearances, the number of which will never be completely exhausted by casual wandering visitors.

The whole territory shows rocky, mountainous landscapes for the most part, which consist mainly of biotite-gneiss in all possible mixtures, with here and there lime-stone and clay-slate of slight extent and thickness superimposed. The hills and mountains are not particularly high—at Killinek not more than 300 to 150 meters,

⁴This might be rendered as "literature at hand," although Hantzsch appears to have had all the publications which were pertinent.—R.M.A.



farther to the east up to about 500 meters, and in the southeastern part of the region under consideration by me, up to some 1000 meters, rising in isolated peaks somewhat higher still—but so rocky, so full of ravines and valleys, that travel is extremely difficult. The natives, of course, know the safest and most convenient connecting paths between the different places in their favourite hunting-grounds, but if one wishes to cover no particular stretch of ground, but to follow the rapidly-flying birds, one has to give up every opportunity of walking on level ground. Especially hindering are the countless deep ravines and the precipitous, even perpendicular walls, which often force one to considerable detours.

Again and again I scrambled around so far, even with my companion who knew the localities, that we found no way out and had to go back rather great distances. All that is (p. 186) not so bad in quiet, cool weather, but unfortunately such weather only rarely prevails. When the warm August sun is streaming down, then one is incessantly pursued by bloodthirsty swarms of countless mosquitoes so that even the oppressive fly-net and the still more unpleasant gloves grant no complete protection. At other times, a sharp wind often blows so violently that every few minutes one has to stand and turn around in order to be able to breathe in peace, or the whole landscape is covered over with a thick fog, which after several hours' travel wets a person through so much that he has to wring out his clothes, and rusts a gun almost beyond cleaning. In a heavy wind the birds often seem to have entirely vanished. I have at times undertaken excursions of five or six hours along with my Eskimo hunter, ready to shoot every bird that came within range, and not seen a single bird. Then I understood why so few ornithologists feel any desire to collect in such rough regions, where besides there is little prospect of discovering new species.

But it would be entirely misleading for me, in whose eyes a deep longing cast a magic spell over those lonely, mountain wastes, to represent them only in such a light. Some times, even if only rarely, they appear in such enchanting beauty that one feels thankful for the great favour of being able to look upon them. Then all the preceding and impending trials are forgotten and one feels as if removed into another, higher world, far removed from the sorrowful existence of everyday life. In such hours I liked on any sort of pretext to separate from my companions, though their minds are in no way apathetic towards the beauty of their home surroundings; seat myself in the grass a little way above and look around.

The air was so pure, and so transparent, the distant mountain-peaks arose as if close before me in the delicate sunshine that lay so golden over valleys and hills, its glow not hot and enervating but rare and invigorating. A gentle breeze murmured over the ground, rising and falling in mystical bell-like tones. Near me Snow Buntings (*Schneeammern*) were playing unafraid and little flowers were gleaming. Below, the glittering sea spread out, ruffled by gentle waves and covered here and there with ice-cakes and scattered icebergs. And in all the deep peace, far from the world, we two, I and my companion, are perhaps for days at a time the only human beings, human beings so free and independent, bound only by the eternal laws of Nature.

In many places the rocks are thickly covered with different kinds of lichens, fewer by mosses, the total impression of which is indeed an insufficient and gloomy one. On protected slopes, in valleys, ravines and rocky crevices, (p. 187), however, grow grasses, herbs and beautiful little flowers. The farther south one travels, especially toward Ungava Bay, the wider grows the kingdom of the phanerogams. In those regions, also somewhat less wild and rough in topography, already are found mountain stretches of freshest green. Trees and higher shrubs are completely lacking to be sure, and even the low woody plants are smaller than in several neighbouring parts of Baffin Island, situated farther north, for example on Resolution Island, in the vicinity of Kennedy Lake [Nettilling Lake], etc. On my excursions in the northeastern parts of Labrador I found only creeping shrubs, raising themselves scarcely a hand's-breadth above the ground, from which it becomes clear that certain species of birds which breed only in shrubbery, especially *Acanthis linaria* [Redpoll], probably breed in several places on Baffin Island in great numbers, but are entirely absent during the breeding season in the nearer and farther surroundings of Killinek. The district under observation by me is also more unfavourable in this respect than the regions adjoining it immediately to the south. A short distance removed from the places where my chief investigations were directed, the bush growth begins, and increases so quickly along Ungava Bay, that at George River it becomes a real forest, something which is not seen on the actual Labrador coast until it appears a little south of Hebron in the form of scanty conifers. The interior of the country really seems to be more favoured in this respect than the coast district.

Frequently on flat and low-lying places, in natural gullies and on bottoms of valleys, marshy

land is formed, which, however, rarely possesses a thick humus layer. Shod with light Eskimo boots, one does not therefore refrain from crossing such wet surfaces. Only a few times did I break through the vegetable layer up to my knees in a clayey and exceedingly sticky mire, from which I could pull my feet only with great exertion. For the most part the marshy flats are covered more luxuriantly and more thickly than drier places with mosses, grasses, and other plants.⁵

Occasionally such swampy, grassy flats form the collecting places or even the expansion areas of small flowing waters. Real brooks with regular sources are not frequent, however, and are mostly small and with little water, so that one can cross them easily, at least in certain places. They neither form any hindrance to travel nor give to the landscape any especial character.

The district is much richer in standing waters. In the neighbourhood of Killinek almost every depression of the ground shows a large or small pond, and every enclosed valley a lake. Now and then from a high point is seen a great number of such freshwater surfaces surrounded by mountains, which form an important characteristic feature of the landscape. In general these mountain lakes have the effect of being gloomy, cold, and dead. Since they are frozen over half of the year, organic life cannot unfold in them very abundantly. Of vertebrates, they shelter

⁵In this publication I go into all the points not directly relating to the avifauna only so far as I consider necessary for the understanding of the same.

only small trout (*Salvelinus fontinalis*) and a relatively small number of water birds, but they form the developing place for the countless mosquitoes, the larvæ of which serve certain birds for food. The larger lakes may be very deep, as I was assured by the Eskimos who occasionally take out their kayaks (skin boats), in order to hunt waterfowl, especially ducks, incapable of flying during the moulting season. On the other hand, in stormy weather one might conclude from the mass of water in these lakes, since such long and high waves form, that he is standing by the sea. Such deep waters probably do not freeze over entirely in winter. Often the lakes fed by brooks are situated so little above sea-level, that the high tide, which on those coasts shows a difference of ten meters from the low tide, reaches them and forms brackish water. This sort of place, especially if between pond and sea there is a great ebb and flow, is particularly preferred by the waterfowl for breeding places.

On summer excursion the larger lakes form a most unpleasant hindrance to travel. One might often travel along their shores, even if swampy in spots, but rocky masses rise steeply from the water and block the way, and one has to clamber over the mountains in a wide curve in order to reach the opposite side. The deep lakes and ponds have few islands, and in general appearance they resemble small inlets of the sea.

(To be concluded)

COLLECTING AT CACHALOT WHALING STATION

By IRA E. CORNWALL, F.G.S.



IN THE SUMMER of 1925 it was my good fortune to spend about a month at the Cachalot Whaling Station. This was the last season that the station was in operation, and probably it was the last whaling station that will ever be operated on Vancouver Island. The station, which is now a fish-reducing plant, is on the south side of Kyouquot Sound, right at the foot of the mountains, and there is no way to reach it except by water.

There seems little doubt that the whales are getting scarcer year by year, and will continue to do so until some international agreement is made to regulate the hunting of them. In fact if the whaling industry is to continue, something of this kind must be done. In some species it does not seem possible to tell the cows from the bulls, and both are slaughtered; so a long

closed season seems to be the only solution of the difficulty.

In the old days when the whales were hunted by sailing-ships, they had a better chance of escape, especially some species which sank when killed, these were not attacked except when found in very shallow water as there was then no way of keeping them afloat. About twenty-five or thirty years ago shore stations were established on Vancouver Island, and small steamers were sent out to hunt. This method also gave the whales a chance to escape, as there was a limit to the distance that a whale could be towed and reach the station in good condition. But with the use of steamers the method of hunting changed. All the species of large whales were hunted, even those that sank when dead did not escape as a heavy rope was attached to

the harpoon and they were hauled to the surface by steam power. Then they were blown up with compressed air to keep them afloat. During the last few years another method has been developed. This is the floating whaling station. A large steamer is fitted with apparatus for extracting the oil from the blubber, and a sloping runway in her bow for hauling out the whale. Several small steamers, like those operated from the shore stations, accompany her, and she can follow the herds all over the oceans, and there is no escape for them.

In the early days of the whaling industry at Vancouver Island, there were several whaling stations at different points on the west coast, but they are all closed. It was a common sight to see large numbers of the huge animals near the shore, and the whaling steamers simply went out and killed whales as fast as they were needed to keep the plants in operation. During the last few years the boats frequently were out for two or three days without seeing a whale. Those of the large, or commercially valuable, species, are never seen where they were a common sight twenty-five or thirty years ago, and it is a long time since any of them were seen between Vancouver Island and the mainland, but at one time there was a whaling station near Nanaimo.

The main object of my visit to the station was to do some research work on the whale barnacles, and to collect any internal or external parasites that could be found. But the method of extracting oil from the blubber, and reducing the rest of the carcass to fertilizer proved very interesting.

The steam whaleboats are about ninety-eight feet long, and have powerful engines, but not very great cruising range. On the forward deck is a powerful winch which is used to haul the whale to the surface after it has been killed, that is, if it is one of the species which sinks when dead. If the weather is warm and the whale has to be towed a long way, it has to be punctured to allow some of the gases to escape, or it will burst. Some time ago a whale burst while a passenger steamer was near it, and as the wind was blowing from the whale to the steamer, it did not take long to clear her decks. On the bow of the whale boat is a muzzle-loading gun, mounted on a swivel and arranged so that it can be very much depressed. This is necessary as it may have to be used at short range, perhaps fifteen or twenty feet. The harpoon is fired from the gun: it is made of steel and is about five feet long; the shaft which fits into the gun is double, that is, it is made of two semi-circular bars welded together at the ends, leaving a space between them. Around one of these bars, and sliding

in the space between them, is a loop of wire rope to which the manila hauling-in rope is attached. The sharp point of the harpoon is really a bomb filled with black powder. It is shaped like a spear head, and is made of cast iron. Below the bomb are four hinged prongs, or barbs, made fast to the shaft in such a way that they will be released as the harpoon enters the whale. The bomb, prongs, and part of the shaft project beyond the muzzle of the gun when it is loaded. When the harpoon enters the whale a strain is put on the rope and the prongs open, this releases a rod which enters the bomb and explodes the charge. The explosion of the charge usually kills the whale at once, but sometimes it fails to explode, or perhaps the explosion does not kill the whale, then the fun commences and it may be hours before the whale is killed and hauled up to the ship. These explosive harpoons were invented by a Norwegian, Svend Foyn, about 1866.

When a whale is killed a mark is put on it to show what boat has killed it, and the hunt goes on. The captain and crew get a good bonus for each whale, according to size and species, and it is very profitable for them if they kill several in a day. The whales are made fast to the boat near the bow, and are towed tail first. The tails are hoisted high out of the water, and usually a portion of them is cut off. The whale-boats are low in the water, and the whales float high as they are blown up with air, so if the boat has one on each side she is almost out of sight between them. The boats usually reach the station at night, the catch is made fast to a buoy near the hauling-out slip, and it is a wonderful sight to go down in the morning and see six or eight huge whales floating in a group. The slip is a sloping wharf extending out beyond low-tide mark and is covered with heavy planking, and it needs to be heavy as a whale weighs about two tons per foot and may be ninety feet long. Each huge carcass is pulled to the slip in turn, a heavy chain is put round the tail, this is attached to a cable which runs through double, triple or quadruple blocks, according to the size of the whale. As the whale is being pulled up the slip, the process of flensing, or removing the blubber, commences. This is done with large knives called flensing knives. Each knife is about eighteen inches long, two inches wide and is curved at the end; one edge and the curved part are sharpened, and the blade is fastened to a handle about three feet long. With these knives cuts are made through skin and blubber from one end of the whale to the other; the cuts are from eighteen inches to two feet apart, according to the size of the whale;

a cable is attached to the end of a strip and it is ripped off by a steam winch. When one side is stripped the whale is turned over and the process is repeated. If the whale is fresh, some of the meat it taken off for canning, as there was a considerable market for it among the Indians. The meat of a Sei whale looks like good beef and is most excellent eating.

When the blubber is all off the carcass is cut open and the inside taken out and boiled to make fertilizer. The skeleton is then pulled to another part of the wharf where it is cut up and made into bone meal. The blubber is cut into pieces and fed into a chopper, from there a conveyor carries it up into the tanks where it is boiled to get the oil out; and what is left is also used for fertilizer. Even the blood is collected and used to make fertilizer.

Only thirty-two whales were brought in during my stay at the station, and they were of only three species. Fourteen were "Sei" whales, *Balænoptera borealis* Lerson¹, this is one of the baleen whales, and is sometimes called the "Sardine". They were remarkably clean and not a single parasite was to be found on any of them. Then there were fourteen "Finbacks", *Balænoptera velifera* Cope²; these were usually a little larger than the Sei whales, and they were also free from any parasites or barnacles. Later on in the summer one of these whales was brought in with what appeared to be a growth of coarse hairs on its throat, but this proved to be thousands of parasitic copepods, *Pennella balænoptera*³. This copepod is one of the largest known, it is shaped like a worm and has its head buried deep in the blubber of the whale. The body is about eight inches long, and near the head are two cross pieces growing at right angles to the body and acting as an anchor. It cannot be pulled out, as the anchor is buried in the blubber. One "Finback" was brought in with its stomach full of small squid, *Gonatus fabrici*, and the whalers said they had never seen that species of whale with squid in it before. There were four "Humpbacks", *Megaptera versibilis* Cope⁴, and all of them carried heavy loads of barnacles.

Most of the barnacles on the "Humpback" were the beautiful *Coronula diadema*⁵. This was first described by Linnæus in 1767 as *Lepas diadema*. Some of the shells of this species are three inches in diameter, and two inches high. They are not embedded in the skin of the whale at any stage of their growth, but the skin of the whale grows up into cavities formed by the shell and anchors it very firmly in position. The shell appears to be formed by triangles fitted together; the radii form one set with

their apices down, and the exposed surfaces of the ribs form the other, with their apices up. The orifice is hexagonal, and is formed by the straight edges of the radii, the ribs forming but a small portion of the margin; the tops of the ribs are usually eroded and show the black skin of the whale like three lines radiating from each corner of the orifice. On some of these barnacles were small pink barnacles, *Balanus trigonus*⁶, also on many of them was what appeared to be a sea-weed, but proved to be a hydroid, *Obelia griffini*⁷. The large shell-less barnacle, *Conchoderma auritum*⁸, does not grow on the skin of the whale, but only on the shell of *Coronula diadema*. It was first described by Linnæus in Systema Naturæ 1767. The part which contains the body is shaped like a bean placed on end on a stalk, the opening is where the bean would be attached to the pod, and there are two ear-like appendages on the top. The third species of barnacle found on the Humpback was *Coronula reginæ*⁹, which is related to *C. diadema* but grows in a different manner, and in a different position. This species grows partly under the skin of the whale: at first it is totally covered, only a small hole in the skin can be seen; as the shell grows it increases in diameter more rapidly than in height and even the largest specimens have only a third of their shell projecting beyond the skin. The shell is very much like that of *C. diadema*, but is much flatter, and the tops of the ribs are not worn off. This species was very difficult to identify as there were some points that were different from any published description. For instance, Darwin described the body-chamber as being "cup-shaped, with all parts visible from one point of view." He must have had many specimens, and as he was a very accurate observer it seems probable that the body-chamber at that time (73 years ago), was cup-shaped. While working on this species specimens were sent to me, from the British Museum, which had been collected in different parts of the world, and there was not one that had a cup-shaped body-chamber: all had the margin of the chamber less in diameter than the interior. It may be possible that the shape of the chamber of this species has changed: the contracted margin of the orifice would be an advantage to the animal, but the time seems very short for such a change to take place. The only other barnacles that were collected were the curious little *Xenobalanus globicipitis*¹⁰ from the tip of the fin of a small Sei whale. This is a species that has frequently been reported from the Atlantic, but does not seem to have been found on a Pacific whale before. Its shell is embedded

in the skin, and the whole barnacle is enclosed in a kind of a sack which hangs from the shell like a tassel.

In the stomachs of many of the whales were large masses of tape worms, and also ascarid worms, *Anisakis simplex* Dujardin¹¹. These ascarid worms have been reported from several species of whales and other marine mammals, but not from the "Sei" whale before. They are from three to four inches long, covered with a very tough skin, and are very hard to kill. Some were placed in four per cent formaldehyde, but were alive four hours later, and the strength had to be doubled before they were killed. In the stomach of the sperm whale are sometimes found curious little white balls; they are about a quarter of an inch in diameter and have been a puzzle to some of the whalers, but they proved to be the partly digested eye-balls of squid on which the Sperm preys.

On the barnacles which infest the Humpback were many of the so-called whale-lice. These are really a small *Amphipod*, *Paracyamus boopis*¹². They are mostly legs, and have huge branchia, as have all the barnacles and other creatures living on the whale.

Captain J. E. Gilmore, who was superintendent of the Cachalot Station, sent me some specimens of whole barnacles in 1923. These included some that resembled *Coronula reginæ*, but not enough to make a positive identification. And it was with the object of collecting a good series of these that the trip was made. Although only a

few species of whales were brought in during my stay, they provided material of much interest.

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BIG HORN SHEEP

By P. J. MORAN

A generous contribution from a prominent Ottawa citizen, who does not wish his name to appear as the donor, has made possible the reproduction of the beautiful illustrations accompanying this article.—EDITOR.

WHERE the bare, splashy-coloured rocks spring sheer from the blue-green, timbered slopes of the mountains; where the whole terra-firma tips up and stands straight on end; where the hoary horns and jagged crags tower heavenward and stab the fleecy-white clouds; where the cliffs fall away into abysmal steeps; where the human finds locomotion reduced to a vertical plane, laborious, stiff, and precarious; where the crypt-like solitude is so oppressive; where the Bald Eagle soars with imperceptible movement on wing; is where the wild Mountain Sheep make their domicile.

Where the steeply sloping meadows drop on the one side into the profound pits of cirque basin amphitheatres, and on the other jag into upright buttresses and perpendicular crags, is where the wild sheep pasture in large flocks in security absolute, except from the Bald Eagle and man. It is where the rams fight out their prolonged, sanguine, butting battles for flock supremacy. It is where the lambkins gambol and butt each other about on the very cliff edges, and tug sturdily at the udders of their mothers, who contentedly crop their luscious food.

On the wild grasses, to a certain extent, but principally on the wild plants and herbage lining the precipices sheep work out a sumptuous living. In the winter months, when the snow piles up



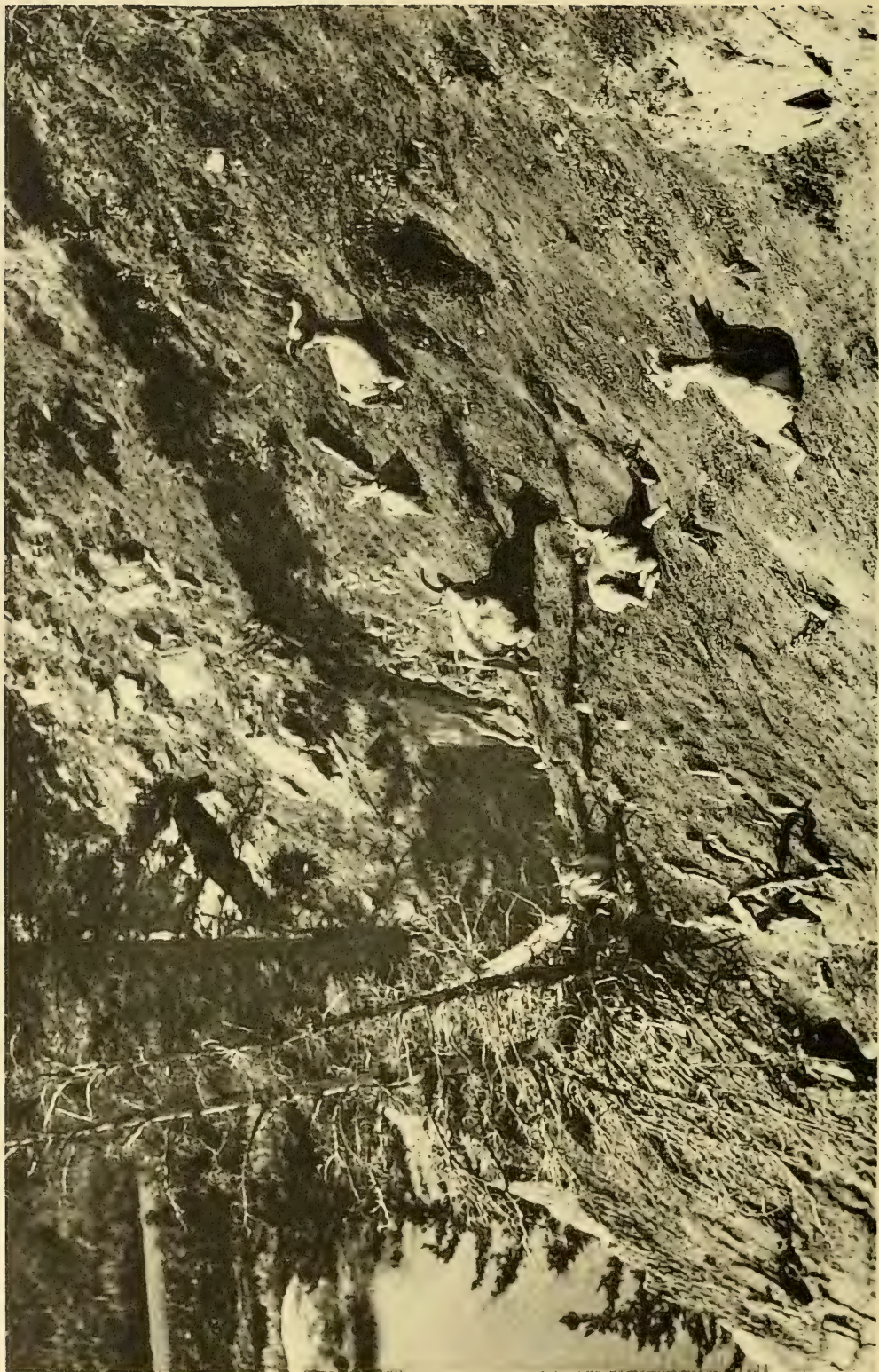
A Monarch, with hair almost completely shed.

Courtesy of
Canadian National Parks
Dept. of Interior - Ottawa



Courtesy of
Canadian National Railways.

Rams and Ewes. In a fraction of a second they are gone.



Courtesy of
Canadian National Railways.

Ewes and Lambs basking in the sun.



White Amber horned Ram.



Courtesy of
Canadian Pacific Railway.

Full coated enormous Big Horn Ram.



Big Horn Ram

Courtesy of
Canadian National Parks
Dept. of Interior • Ottawa.



Courtesy of
Canadian National Railways.

A sky-line shot—perfect



Courtesy of
Canadian Pacific Railway.

A magnificent group. Examine closely.

into monster banks, when the wind howls up and down the slopes, and when the thermometer drops to sixty below, they steal furtively down into the valley bottoms, paw the snow, apprehensively crop the thriving herbage exposed, and rush in panic to the security of their tilted habitat for protection from their natural enemies, the cougar, lynx, wolf and coyote.

Secure in their inaccessible haunts, they have but one natural enemy, the feathered demon of the air, the Bald Eagle. With bullet-like drop, these pirates swoop down with feathers buzzing, sink their lance-talons into the back of a lambkin, and brain it with one sweep of their scimitar-like beak. With wildly beating wings they scare the flock into panic, close their talons squarely into the lamb's back, stretch their seven-foot spread of wings to the extreme limit, and glide with arrow-like precision to their cliff or tree nest.

Goats are the least suspicious of all animals dwelling in the mountains. They keep an observant watch down and laterally for the cougar and lynx, but they seem quite oblivious to their higher surroundings, except to flatten out for slide rock. This is the reason why goats are so easily stalked from above.

Sheep, on the other hand, are the most suspicious, alert and keenly observant animals living. They scan the up-slopes above as earnestly as the slopes below. A large flock grazing on a tilted meadow posts its sentries both above and on the edge of the precipices falling away. The sentries, very attentive to their duties, may be seen constantly moving their heads searching the prospect for any strange movement.

Sheep have a very powerful and well-developed sense of smell. The scent of man will swerve a whole herd into immediate protective action. A rock cascade leaves them not indifferent. They search intently its course and source. Nothing is left to chance.

Sometimes, hot on a steep slope, they excavate hollows with their hoofs, and lie down in these to rest and bask in the sun bath. Some with their heads erect, others on their sides stretched out like a dog or a puss cat before the hearth.

No bluff, no crag seems too vertical for them to ascend. They traverse a trail up sheer cliffs on which it is impossible to detect a foot or hand hold. With admirable intrepidity, they follow the faintest cracks back and forth up a cliff face with erect and free-moving bodies. They ascend and descend very much like their close relative, the goat. They walk quickly up inclined surfaces, spurt up the broken ground, and secure altitude fast by those queer little

jumps so noticeable in the goat. They jump like a hobby horse, secure with the fore feet, and raise the hind legs to the same level. So quickly, certainly, and smoothly do they perform this operation that it is not appreciated except by keen and close observation. To watch this performance on the sheer precipices is one of the most fascinating relaxations in the hunt. By a swift series of these remarkable little jumps, it is amazing with what rapidity they gain altitude.

Unlike the goat, sheep are not fussy, nor have they any fixed idea about going up always. The goat seems obsessed with the mounting idea to avoid all danger. If danger threatens, the sheep are very discriminating; if the threat is from above, they melt down a bluff like a snow patch under the blazing sun; if from below, they will mount even faster than the goat.

In travelling up and down bluffs, they string out into single file and follow the leader. Often the best selective shot is obtained by allowing the flock to walk right into range. When disturbed in their trek up or down the bluffs, as by their leader being knocked down by a shot, they will change direction and advance in echelon for a little but soon return to single file. Their column of route wears well-defined trails, sometimes used by humans in travelling the cliffs. In the North country, sheep trails are nearly always negotiable by man; in the South, the trails have wide gaps without bottoms, which renders them in most cases useless.

On a bright morning, just to the south of Rocky Mountain Park, I came to the foot of a huge towering precipice of great lateral extent. It was built of limestone highly tilted and dipping outwards into the side slope of the mountain. The scaling of the limestone was such that all clefts and crevices appeared upside down for climbing. After a serious attempt, I decided it was impossible to make a descent, and returned to the talus. Gazing down at timber line, I saw three young ewes emerge from the brush and begin frisking playfully about. I sat down, froze, and watched their ascent. Suddenly, the three, apparently at the same moment, saw me; the quick turn of their heads indicated their find. They came abreast directly for me in a very business-like and menacing manner. I was young in the mountains and had often heard "Sourdoughs" state the reason that sheep and goat never frequent the same range is that a pitched battle decides possession. As they rapidly approached, I began to wonder if I were to be the goat. I had no weapon and felt extremely uncomfortable. When about ten feet away, they sniffed, abruptly rose on their hind

legs exposing their clean white bellies, swerved decisively, and leisurely walked up the impossible bluff. I looked up amazed and immediately tried to follow. I reached a point where I had noticed them jumping across. With four hundred feet of nearly smooth sheer wall below me I turned about and regained the foot. More "bull" of the "Sourdoughs". They had assured me that any human could follow a sheep trail.

Sheep flock on unbroken ridges of great longitudinal extent; individual flocks are indigenous to their own ranges, and keep within their limits as closely as the homesteader stays within the boundaries of his quarter section. Where the flocks are large and their range great, there is more likelihood of sheep maintaining their natal identity and of a greater percentage of big horns. By some scientists this is attributed partly to the fact that broken ridges afford easier access to hunters and hence greater casualties in the Big Horns. On the borders of the different sheep ranges there is an interbreeding that causes a wide variety of pelage and horn types.

The universal white rump patch is claimed by some savants as having a profound, protective, camouflaging value, but the ordinary mortal finds it difficult to appreciate this value for the white moving rump attracts the eye even quicker than the semaphoring white fluffy stub of the white-tailed deer. Other savants attribute the white rump to the provision of nature for facile identification in group movement.

The rams and ewes part company in early spring. They herd in separate flocks throughout the summer months. In late fall they again band together for the winter. Single and twin lambs are born between the middle of May and the middle of June.

It is believed that in geological ages ago, when the North American Continent made direct connection with Asia, the Asiatic sheep migrated to the North American Continent, and it is from these nomads that the North American Sheep are derived. They all come from the same stock.

There are three distinct species of Mountain Sheep in Canadian Western Cordillera, differentiated by the colour of their pelage and shape and colour of horns.

The Bighorn, or Rocky Mountain Sheep (*Ovis canadensis* Shaw), probably the best-known member of the sheep family, is found principally in the Rocky Mountain system from the forty-ninth to the fifty-fifth parallel of latitude. It thrives, however, on many of the ranges in southern and central British Columbia, excepting the wet western slopes of the Coast Range. Its grey mantle envelopes it somewhat like a

blanket. Its nose, sometimes its face, its belly, rump, and inside of legs are a pure white.

The sheep of Alaska, Yukon, and part of northern British Columbia (*Ovis dalli* Nelson), are easily identified by their pure white pelage, and striking amber-coloured horns. A few scattered grey hairs verify their close relationship with the general family. Throughout the fall and winter months, their coats are beautifully white. In spring, they are by earth and excrement discoloured yellowish-red. This species is par excellence the most magnificent member of the family.

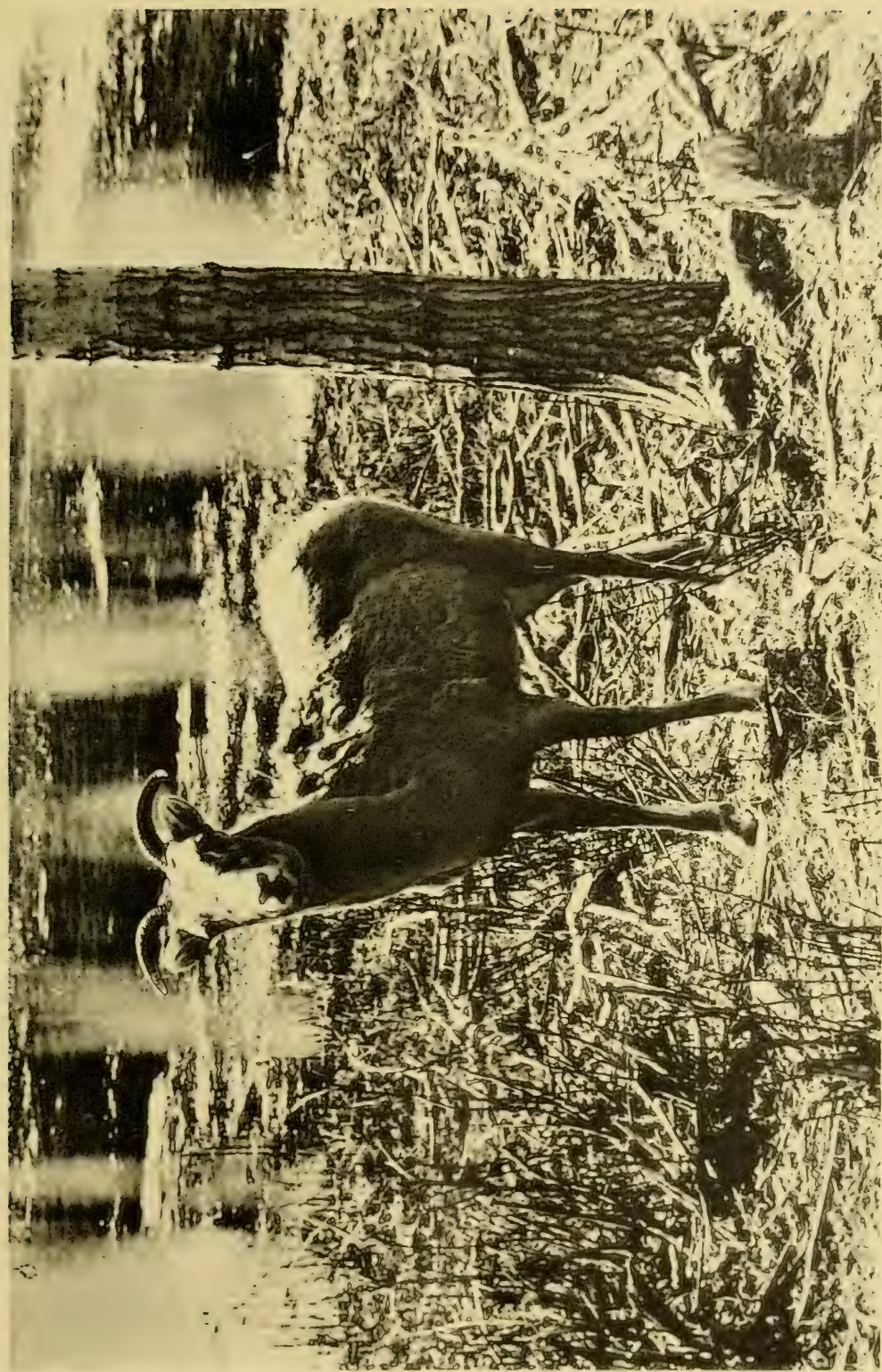
The Black Sheep (*Ovis stonei* Allen), is found in the Cassiar Mountains at the headwaters of the Stikine, Findlay and Liard Rivers. The top of its back is a brownish-black; the balance of its blanket, grey; the nose, belly, rump and inside of legs, white.

The Saddleback Sheep (*Ovis fannini* Hornaday), found at the headwaters of the Yukon, is considered an intermediate between the pure black and pure white varieties, in typical form. The dark grey mantle rests on its back like a saddle blanket. The upper outside of its legs are slightly grey, and the balance of the body white. It has amber horns.

A full grown Rocky Mountain Sheep measures about thirty inches tall at the tip of the shoulder, and about five feet extreme length. It weighs between two hundred and two hundred and fifty pounds. These measurements are exceeded in some cases, but not commonly.

Sheep, unlike their domestic equivalents with their heavy coats of wool, are coated with coarse, brittle guard hair somewhat resembling a deer. The undercoat is woolly, but very short. Where, at a distance the colour of its blanket appears to be a grey, closer examination shows it to be brown tinged with grey. Approaching maturity, its coat grows darker. The sun, during the summer has a decided bleaching effect upon the colour of its pelage.

Sheep, like goats, shed their hair between the months of April and September. In late spring, like goats, they have a very ragged and disreputable appearance, much as a dog with a virulent attack of the mange. While shedding their hair, their hides appear itchy, for continually they may be observed rubbing against and pushing their way through thickets, brushing up against trees and rocks, and seemingly enjoy their scratch. At timber line, the willows, alders, tree trunks and rocks have a copious decoration of clinging sheep's hair throughout the spring and early summer months. The rocks of the talus, near



Courtesy of
Canadian National Parks
Dept. of Interior - Ottawa

Full Coated Ewe.

the tree line in places, often show quite a heavy coating of shedded hair.

Sheep have small, hard, black, cloven hoofs, split like the goat's but larger. with the sheep the open end of the "V" is in the direction of travel; with the goat, it is vice versa. Savants relate that in the cleft of sheep's hoofs nature has provided small receptacles of highly odorous secretion which with the spring of the foot from walking emits a trace of secretion leaving a distinct scent behind. By this scent, other members of the family recognize the proximity of the flock.

The horns of the ewes are short and small in circumference at the base. They are from five to nine inches long, growing erect and flattening out towards the points and rear.

Rams' horns vary widely in dimensions and style. There is an infinite variety of curls, colouring, base circumferences and crinkles. They range from massive at the base to small at the base. Age rings at the base of the horns indicate the maturity of the animal. An average-sized Bighorn has a horn curve of forty inches, and a base circumference of sixteen inches; the largest specimen recorded is one taken from the Rocky Mountains, measuring fifty-one and one-half inches curl and eighteen inches circumference at the base.

As rams advance in age, their horns curl more and more, until a very old individual has his horns curling through a complete circle and sometimes a little more.

From fighting and rubbing on the rocks, their horns are nearly always broken off, blunted, or stubbed at the tips. Seldom are really perfect horns obtained.

Speaking generally, there seems a tendency of smoother horns to the South and crinkled and more serrated horns to the North.

The ideal way to stalk sheep is to reach a cliff high above them unobserved, with the sun blazing in their faces, and the wind blowing from animal to observer. These conditions are seldom obtained simultaneously; it is well, however, to keep these points in mind and endeavour to have as many as possible working favourably. Stalking from directly below is very uncertain and heart-breaking in its multiplicity of failures. Better to make a complete circuit of the mountain to obtain proper position than waste time in hard laborious climbing from below, for in nearly every attempt it will be found futile. Not only the keenness of the sheep's scent, sight and hearing have to be reckoned with, but the mountain marmot also joins the first line of defence,

and then it is a case of working against overwhelming odds.

In the North Kootenay, through powerful glasses, I observed a splendid specimen of rams' horns, standing erect and alert on the brim of a large cirque basin amphitheatre. Four hours' stealthy, laborious climbing brought me successfully to within a hundred yards of the enticing horns, in ideal position for a photograph, the sun just right, the shadows perfect, the cloud background wonderful. I was not content with the distance; I endeavoured to lessen it so that the animals would fill more of my finder. For some little time, I had noticed the piercing shrills of the whistlers; I gave it little attention, for I believed that the sheep were well inured to that static. I crawled carefully a few yards and stopped dead for the whistlers appeared to shrill out again in unison more fiercely. The sheep suddenly froze and with heads erect indicated a new appearance of extreme attention. The coveted ram threw up his head as though sniffing for scent, and diligently searched the ground above, around, and below, particularly the exact spot where I lay concealed motionless with just an eye out close to the ground. A few yards more advance on my stomach well under cover, again the piercing whistles and when I peeked again, the sheep had disappeared. I stood erect, stretched my cramped body, damning the whistlers. I walked up to the brink of the precipice and gazed down a two-thousand-foot drop. I observed my late intimate friends slowly descending, traversing the sheer face, and occasionally standing to gaze intently back up at the brim.

The whistlers were the cause, I felt, of my disappointment. Back I hurried to investigate these disturbers of the solitude. I observed that my descent was marked by a constant, ever-extending, semi-circular ring of whistles. After dropping down slope a few hundred yards, I turned and advanced up hill. Again I found the flexible semi-circular ring of sentries blowing their blasts. In the better light, I noted the whistling rodents popping out of their crevices, whistling, and sitting erect upon their dirty little rumps, on guard. As I approached close to identified individuals, they scurried with a squeak into their rock holes, while others at greater range popped up, still keeping me within a ring of whistles, about twenty-five yards' radius. The strange eternal vigilance which ever way I turned; I was always completely encircled with whistlers who were ever ready to herald the direction of any movement I might make. I would suggest, therefore, the advisability of

avoiding earth-covered rock slides when stalking game in close proximity.

I hesitate to relate another experience in the same locality, for it seems so contrary to all other experience and is seldom believed.

I had been all morning closely watching a large flock of sheep, trying to get close enough to snap a big-horn member of the flock. I waited patiently throughout the afternoon, lying still, silent, cold and cramped on the head of a sheep trail on the brim of a cirque basin, trusting that the sheep would mount to snapping distance. I was out of luck; no success at all. They remained in the basin and on its talus slopes, but made no attempt to mount or approach my position. As the shades of evening were falling, disgusted with the wasted day, I slipped over the edge of the cirque and started down a route that I had studied and considered easy. I was just beginning to get warmed up when I ran into difficulty; I was forced to traverse, and swung out round a knife-edge ridge, to find myself on a short narrow shelf, occupying the same precarious footing with a huge ram. In the failing light, he appeared as large as a buffalo, with horns enormous. His head was bent low to the shelf as though in charging attitude. I reached for a suspension grip, and I remember the little prayer that flashed through my mind, a remnant of my childhood "Oh! Rammy, Rammy, Rammy, best sheepy in the town", and wished that there was something soft like "Deacon Allen's pew" to land in. Shouting like a raving maniac, I waved my free arm and leg, making a wild, boisterous commotion. The ram hopped about face and slipped down the bluffs with a seeming indifference and intrepid ease. I watched closely and followed his trail down. So few believe the above incident that I myself sometimes doubt it. However, for a few seconds, it seemed ages, I had a real scare which sometimes even yet visits me in my dreams.

The safest and most deadly shot for killing sheep is one directed about six inches below the tip of the shoulder. In my opinion, it is not wise to fire at greater range than two hundred yards, except with a heavy rifle, and who wishes to tote a heavy rifle up and down bluffs? It should be distinctly remembered that distances in the mountains are nearly always underestimated. They appear much shorter than they really are. Experience is the only corrective.

It is better to hunt sheep alone. There are enough elements working against a successful hunt without having two or three conflicting human inspirations clashing to upset a whole day's climbing. Sometimes sheep will be fully

visible to one and absolutely out of sight to another a few yards away.

The meat of sheep is palatable and delicious. In my opinion it should be roasted or fried, except lamb meat, which, of course, now is strictly prohibited. To me, goat meat of an old animal resembles shock absorbers in its tenderness. Kid meat is very palatable, but now it, too, is strictly prohibited.

In southern British Columbia, the slopes of the mountains are heavily wooded and the going is heavy. Timber reaches six thousand five hundred feet. The country is magnificent and still retains its quota of sheep. In the inter-park areas far off the main lines of travel, sheep are, in places, abundant. If it is desired to mingle the æsthetic with the hunt, southern British Columbia and Alberta are the localities, par excellence, to seek sheep.

If it is just sheep that one desires and wishes to make it a serious business where wide selection may be obtained, in the great game country of the North Land Cordillera, in the Yukon, Alberta, and British Columbia between North Latitude fifty-two and sixty-six degrees is the happy and satisfying hunting ground.

The timber line in the North Country varies from zero, in some parts of the Yukon, to three and four thousand feet above sea level in the Cassiars. The country compared to the South is desolate. The tremendous winds that sweep the ridges and summits make travelling difficult and sometimes impossible. In the lower levels the going is good and easy.

With regard to definite localities for particular specimens, the Ogilvie Mountains of the Yukon for the White Sheep, the headwaters of the Yukon for Saddlebacks, the Cassiars for Black Sheep, and Smoky River Country of the Rockies in Alberta, and the southern inter-park areas of Alberta and British Columbia for the Bighorn are probably the most favourable localities. To make a successful hunt in the far northern localities, it is necessary to be on the way in the middle of the summer, in order to reach the best ground at the most propitious season.

In your first hunt for rams, after sighting the flock, you are keened up to eager anticipation and earnest fixed idea of securing a pair of the most desired horns. Buck fever has nothing on your attack of ram fever. After a long arduous climb and the unexpected sight of game, you try to lay your rifle in preparation for the killing shot, but as the sheep approach you find your foresight describing the most intricate geometrical designs, circles, ellipses, parabolas, hyperbolas and involutes. You become obsessed with the

dea to fire long before range is secured. When you drop your rifle a dozen times to dry your hands and grips, you will know ram fever. At the first killing, when you see the ram rear up on his hind legs or sway uncertainly from side to side, and plunge headlong into space, in your eagerness you can scarcely control the impulsive desire to rush forward in search of the prize on the talus. Later, you will learn to remain rigid and concealed, waiting for the larger pair of horns. Where there is one ram, there is generally another, and it is always the one that you have not seen that has the bigger horns.

As a trophy of the hunt, a deeply wrinkled brace of spiralled horns, massive upon their base, will serve in after years to recall those precious moments of intimacy with the mountains—moments perhaps when those same horns,

delicately poised, were silhouetted in a fleeting flash upon an azure screen. They will bring to mind again the conquest of almost vertical cliffs, awe-inspiring in their majestic steepness. They will associate themselves with the aurora borealis, with its rapier thrusts reaching to the blue-black ceiling, with its billowy snow white and multi-coloured sheets that well up from the horizon or hang in folds from the zenith.

Possession of such a trophy, personally gained, is positive testimony that one has experienced the hazards of the upland trails, and has been in close grips with the titanic forces that ever seem to envelop Nature's upheaved masses. Its possession, in short, is a proof and a reminder that at one time the owner experienced the sublime thrill of ascending to a point close upon the roof of the world.

NOTES AND OBSERVATIONS

ANNUAL REPORT MCILWRAITH ORNITHOLOGICAL CLUB, 1927.—During the year 1927 the McIlwraith Ornithological Club held six regular meetings. They were all held in the Y.M.C.A., the average attendance being 21. Mr. W. E. Saunders was the speaker at all of the meetings and the following subjects were dealt with: Shore Birds, Game Birds, Sparrows, Warblers, Flycatchers, Swallows, Nuthatches, Wrens, Kinglets, Vireos and Thrushes. He also gave a report of the meeting of the A.O.U. held in Washington.

On Friday, May 13th, the annual bird morning for the students of the Normal School was very successfully carried out. Two hundred students took advantage of the opportunity to get some practical field experience, and a total list of 65 birds was observed.

On Saturday, May 21st, the annual picnic of the club was held at Wonnacott's farm. The weather was favourable and the 40 who were present enjoyed the outing very much.

On May 24th a party of six took an all-day census and listed a total of 109 species, which bettered the 1925 list by 2.

The Christmas Census was taken on December 24th, and as reported elsewhere in these columns, a total of 32 species were observed (including English Sparrows), plus two unidentified Hawks which may or may not have been the same as some of those on the list. Total 1234 individuals, plus English Sparrows.

The number of species seen during the year

was 189, some of the more noteworthy being Gadwall, Wood Duck, Whistling Swan, Dowitcher (a new record for the county), Hudsonian Curlew, Goshawk, Snowy Owl, Pileated Woodpecker, Horned Lark, Hoyt's Horned Lark, Lapland Longspur, Louisiana Water-thrush, Connecticut Warbler and Carolina Wren.—M. A. MCKONE, *Recording Secretary*.

ANNUAL MEETING, OTTAWA FIELD-NATURALISTS' CLUB.—The 49th Annual Meeting of the Ottawa Field-Naturalists' Club was held in the Lecture Hall, Victoria Memorial Museum, Tuesday evening, December 13, 1927. President Norman Criddle was Chairman. The report of the activities of Council, and the financial statement for the past year, were presented and approved. Dr. E. M. Kindle was elected President for the ensuing year; J. F. Wright and B. A. Fauvel were re-elected Secretary and Treasurer respectively; and last year's Council, with a few changes in personnel, was re-elected.

The brief business session was followed by the annual address, delivered by Mr. Norman Criddle on *Wild Life Studies in Manitoba*. Over 60 artistically coloured lantern slides of the wild animals and their habitat were shown, and the lecturer told in a very pleasing manner of his many interesting experiences in studying these animals. The address was exceptionally interesting and educational.—J. F. WRIGHT, *Secretary*.

OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

Published by Authority of the National Parks of Canada Branch, Department of the Interior, Canada

In the following returns upon banded birds it will be noted that some returns will be thought to indicate, from the date of capture, violations of the Migratory Bird Act of Canada or the United States. The great majority of returns, which seem to indicate violations, are from birds accidentally caught in traps set for fur-bearing mammals, from birds caught in fish nets, killed by oil, or from birds found dead from unknown causes. Appropriate action has been taken in connection with the few returns which indicate illegal shooting.

* * *

The following returns upon birds, banded by Mr. Jack Miner, at Kingsville, Ontario, have been gathered from various sources, and are now made a part of the Canadian Record, with Mr. Miner's consent.

MONTANA

MALLARD:—

One male, banded in 1915, was shot in Odell Creek, near Red Rock Lake, in October, 1919, before October 9th.

NEW JERSEY

MALLARD:—

One, banded in 1917, was shot in the Moonachie Creek, Bergen County, on December 26, 1917.

BLACK DUCK:—

One, banded in 1917, was killed on Warner's Sedge, near Barnegat Lighthouse, Ocean County, on November 1, 1922.

CANADA GOOSE:—

One was shot on the Bay at West Creek, Ocean County—reported March 25, 1918.

NEW YORK

MALLARD:—

One, banded in 1917, was found wounded on Seneca Lake, Watkins, in January, 1918, before January 9th. It died the day after it was recovered.

BLACK DUCK:—

One male, banded in 1916, was killed at the South Side Sportsmen's Club, Oakdale, Long Island, on December 1, 1917.

CANADA GOOSE:—

One, banded in the spring of 1924, flew into a decoy pen, was captured, had its band removed, and was released, in the latter part of October, 1924—reported by a resident of New York City.

One, banded in the spring of 1926, was shot in a large wheat field, two miles south of Lake Ontario, at Hamlin, on October 23, 1926.

NORTH CAROLINA

MALLARD:—

One male, banded in 1921, was shot in the Cypress Creek Section, near Trenton, on December 28, 1921.

One male, banded in 1921, was killed on a canal at Belhaven, on November 17, 1922.

One male, banded in 1922, was killed in New River, Onslow County, on November 18, 1924.

SCAUP DUCK:—

One, banded in 1925, was killed on the main waters of Goose Creek, Pamlico County, on January 19, 1926.

DUCK:—

One male was killed in Daniel County, on December 12, 1921.

CANADA GOOSE:—

One, banded in 1915, was killed about nine miles south of the Virginia line, in the north-eastern part of North Carolina, along the Atlantic Ocean, in Currituck Sound and County, in January, 1916. It wore two bands.

One, banded in 1917, was killed in a duck pond at Chaplin's Bluff, Currituck County, on January 7, 1918.

One was killed on the Roanoke River, on January 2, 1917.

One was killed on Lake Mattamuskeet, Hyde County, on November 14, 1917.

One was killed in November, 1917—reported by a resident of Woodlugh, Currituck County.

One, banded in the spring of 1918, was killed by a resident of Poplar Branch, on December 23, 1920.

One was killed on the marsh of the Pine Island Club, on Currituck Sound, on January 29, 1918.

One, banded in the fall of 1919, was shot near Oyster Creek, Currituck Sound, on November 10, 1921.

One was killed at Mattamuskeet Lake, Hyde County, on January 30, 1920.

One was killed at Mattamuskeet Lake, Hyde County—reported December 1, 1921.

Two, banded in 1922, were killed at Rose Bay, Hyde County, on November 30, 1922.

One, banded in the spring of 1922, was "secured" at the Pine Island Club, Poplar Branch, on January 1, 1923.

One, banded in the spring of 1922, was shot by a resident of Elizabeth City, on January 15, 1923.

One, banded in the fall of 1922, was shot at the Currituck Club, about December 26, 1923.

One, banded in 1922, was killed on the Monkey Island Gunning Property, Currituck Sound—reported February 8, 1924.

One, banded in 1922 (?), was shot in North Carolina—reported February 2, 1927.

Four were killed at Deep Bay, Swan Island Point, Hyde County, on Thanksgiving Day, 1922.

One, banded in 1923, was killed in Indian Creek, a tributary to Currituck Sound, Currituck County, on November 1, 1923.

One, banded in 1923, was shot at Cleve's Floating Island, Wills Bay, Currituck Sound, on November 5, 1923.

One, banded in 1923, was shot off Carner's Island, Currituck Sound—reported November 13, 1923.

One, banded in 1923, was killed on Lake Mattamuskeet, Hyde County, on November 15, 1923.

One, banded in 1923, was killed on the Pamlico Sound, twenty miles south of Roanoke Island, on November 21, 1923.

One, banded in 1923, was killed in Currituck

Sound, opposite Currituck Beach Light, on November 22, 1923.

One, banded in 1923, was killed at Lake Mattamuskeet, Hyde County, on December, 8, 1923.

One, banded in 1923, was killed at Goose Point, Currituck County, on December 10, 1923.

One, banded in 1923, was killed at Currituck Sound, on December 10, 1923.

One, banded in 1923, was killed by a resident of Waterlily, Currituck County, on November 1, 1924.

One, banded in 1923, was killed at Currituck Sound, on November 10, 1924.

One, banded in 1923, was killed by a resident of Powell's Point, Currituck County—reported December 7, 1924.

One, banded in 1923, was found dead on the beach of Mackay Island—reported April 7, 1925.

One, banded in 1923, was shot in Currituck Sound, on December 7, 1925.

One, banded in 1923, was killed in Currituck Sound, on December 12, 1925.

One, banded in 1923, was killed by a resident of Fairfield, on December 24, 1925.

One, banded in the first week of May, 1923, was wing-clipped and shipped to the Poultry Division, Experimental Farm, Ottawa, Ontario, on May 8, 1923. Mr. Hoyes Lloyd placed Biological Survey band No. 202,127 on its other leg on June 7, 1923. It was shot on Currituck Sound, near the Currituck Courthouse, on November 12, 1926.

One, banded in 1923, was shot at Poplar Branch, on December 6, 1926.

One, banded in the fall of 1923, was killed at Bluff Bay, on January 31, 1927.

One was killed in Currituck County, on January 22, 1923.

One was killed in Currituck Sound, on November 9, 1923.

One was shot off Carner's Island, Currituck Sound—reported November 16, 1923.

One was killed by a resident of Bath, about the middle of November, 1923.

One was killed in Brocks Bay, in November, 1923.

One, banded in the spring of 1924, was killed at Knott's Island, Currituck County, on November 4, 1924.

One, banded in the spring of 1924, was killed by a resident of Knott's Island, on November 7, 1924.

One, banded in the spring of 1924, was shot on Currituck Sound, near Poplar Branch, on January 12, 1925.

One, banded in the spring of 1924, was shot in Currituck Sound, on January 15, 1925.

One, banded in the spring of 1924, was killed on Mattamuskeet Lake, Hyde County, on January 28, 1925.

One, banded in the spring of 1924, was killed just south of Kitty Hawk, on November 13, 1925.

One, banded in the spring of 1924, was killed on Currituck Sound, in the week of November 23, 1925.

One, banded in the spring of 1924, was killed at the Currituck Club, P.O. Poplar Branch, Currituck County, on December 26, 1925.

One, banded in the spring of 1924, was killed in Bailey's Island Bay, Currituck County, on November 22, 1926.

One, banded in the spring of 1924, was killed on Currituck Sound, near Grandy—reported December 13, 1926.

One was killed by a resident of Powell's Point, during the hunting season previous to May 21, 1924.

One was killed—reported by a resident of Poplar Branch, on November 11, 1924.

One was killed at Mattamuskeet Lake, Hyde County, on November 13, 1924.

One was killed near Lafayette—reported November 21, 1924.

One, wearing Mr. Miner's band on one leg and a band with the inscription "J. Haggarty, Detroit" on the other leg, was found with some tame geese, and was kept in a pen at the Harbor Island Duck Club, near the junction of Cove and Pamlico Sounds, in the fall of 1924.

Two, banded in the fall of 1925, were killed by a resident of Grandy, on January 21, 1926.

One, banded in the fall of 1925, was killed by a resident of Grandy, on January 22, 1926.

One, banded in 1925, was killed on Great Shoal, Dare County, on November 22, 1926.

One, banded in 1925, was shot on the reedy shallows of Long Shoal, at the mouth of the Alligator River, North Carolina, some thirty miles south of Norfolk, Virginia—reported November 29, 1926.

One, banded in the fall of 1925, was killed in Richmond County, on December 23, 1926.

Two, banded in the fall of 1925, were killed on Currituck Sound, on January 20, 1927.

One, banded in the spring of 1926, was shot in Currituck Sound, on November 1, 1926.

One, banded in the spring of 1926, was killed on Pamlico Sound, at Big Porpoise Point, between the mouth of Neuse and Pamlico Rivers, on November 1, 1926.

One, banded in the spring of 1926, was shot at Lake Madam Mattamuskeet, Hyde County, on November 2, 1926.

One, banded in the spring of 1926, was killed by a resident of Grandy—reported November 29, 1926.

One, banded in 1926, was shot at Poplar Branch, on December 6, 1926.

One, banded in the spring of 1926, was killed on the east side of Currituck Sound, at a point about a mile from the lighthouse and about half way down the Sound, on December 9, 1926.

One, banded in the spring of 1926, was shot on Mattamuskeet Lake, Hyde County, on December 17, 1926.

One, banded in the spring of 1926, was killed in the fall of 1926—reported by a resident of Fairfield, Hyde County.

One, banded in the spring of 1926, was killed in Currituck Sound, near Adylett—reported January 13, 1927.

One, banded in the fall of 1926, was shot on Mattamuskeet Lake, Hyde County, on December 27, 1926.

One, banded in 1926, was killed at Harbinger, on Currituck Sound, on January 7, 1927.

One, banded in the fall of 1926, was killed at Sportsmen's Home, on the eastern side of Currituck Sound, on January 10, 1927.

One, banded in the fall of 1926, was killed at Currituck Sound, on January 11, 1927.

One, banded in 1926, was captured alive in North Carolina, on January 20, 1927, and was

sold to a resident of Stratton, Colorado—reported February 2, 1927.

Two were killed by residents of Grandy, on January 22, 1926.

One was recovered—reported by a resident of Jennings, on August 26, 1926.

One was killed by a resident of Poplar Branch, on November 9, 1926.

One was killed at Porpoise Point, on November 12, 1926.

One was killed by a resident of Stumpy Point, Dare County, on November 23, 1926.

One was killed at Pea Island, Dare County, on November 26, 1926.

One was shot at Currituck Sound, shortly before December 23, 1926.

One was killed at New Holland, on Lake Mattamuskeet, Hyde County—reported December 23, year (?).

One was killed in the mouth of Rose Bay, Hyde County, on December 28, 1926.

One was killed in Currituck Sound, near Adylett, on January 6, 1927.

One was killed at Grandee—reported January 20, 1927.

One was killed at Kitty Hawk Bay, Kitty Hawk—reported January 20, 1927.

One was killed in Currituck Sound—reported January 30, 1927.

NORTH DAKOTA

MALLARD:—

One, banded in 1917, was shot by a resident of Fredonie, on September 18, 1918.

One male, banded in 1921, was killed on Goose Lake, thirty miles east of Bismarck and fifteen miles south of Driscoll, on October 16, 1922.

DUCK:—

One, banded in 1919, was shot on a farm near Lidgerwood, on October 12, 1920.

One was shot in the vicinity of Carrington, about October 14, 1919.

One was shot at Salt Lake, about nine miles south-east of St. Thomas—reported September 20, 1923.

CANADA GOOSE:—

One was recovered in North Dakota—reported February 23, 1927.

OHIO

MALLARD:—

One male, banded in 1915, was caught in a steel trap and released after its band was removed at Greenville, on March 15, 1916.

One, banded in 1917, was shot in a marsh about seven miles east of Sandusky, on November 23, 1917.

One female, banded in 1917, was found dead at Irwin, about thirty-five miles from Columbus—reported April 16, 1927.

One, banded in 1918, was killed on the Ottawa Shooting Club Marsh at Fremont, in September (?), 1918.

One male, named Joseph Mulberry, banded on July 14, 1919, left in August, 1919, and was shot near Columbus, on December 13, 1919.

One was killed in the Scioto Bottoms, on December 10, 1921.

One male was killed on Big Darby Creek, thirteen miles north of Circleville, in Pickaway County—reported December 17, 1921.

One female, banded in the fall of 1925, was shot one hundred miles south-west of Cleveland, on the Tusarawas River, on December 17, 1925.

BLACK DUCK:—

One male, banded in 1915, was killed on the bank of Lake Mercer, on December 13, 1916.

DUCK:—

One was found frozen near Orient, Piqua County, on December 19, 1916.

One was recovered—reported by a resident of Sekitan, on March 22, 1917.

One was killed in the marsh along Lake Erie—reported November 22, 1917.

One was killed by a resident of Port Clinton, on November 28, 1917.

One, banded in 1921, was killed in Sandusky Bay, on December 13, 1921.

One was killed by a resident of Circleville on January 15.

CANADA GOOSE:—

One, banded in 1922, was shot by a resident of Curtice, about two miles south of Lake Erie, on December 13, 1924.

One, banded in the fall of 1922, was killed one mile north of Coldwater, Mercer County, five miles from the Indiana State line, on December 24, 1924.

One, banded in the fall of 1924, was killed on a farm just out of Columbus—reported October 28, 1925.

One, banded in the fall of 1924, was shot in a wheat field off the Grand Reservoir, Mercer County—reported December 16, 1925.

One, banded in 1922, was found dead on a farm one and one-half miles south of Lake Mercer—reported March 17, 1924.

One was killed on the Grand Reservoir at Celina, Mercer County, on December 14, 1925.

Three, banded in the fall of 1926, were shot on a farm near the St. Mary's Reservoir, in Auglaize County, on December 11, 1926.

One, banded in the fall of 1926, was captured alive and kept as a decoy about six miles south of Lake St. Marys, on December 31, 1926.

SPECIES UNKNOWN:—

One, banded in 1922, was recovered—reported by a resident of Amanda, Fairfield County, on March 23, 1923.

PENNSYLVANIA

DUCK:—

One, banded in 1917, was shot on the Tunkhannock Creek, at Eastlemon, Wyoming County, on December 14, 1917.

One, banded in 1917, was killed at Ritchie, Clinton County, on December 22, 1917.

CANADA GOOSE:—

One, banded in the spring of 1926, was recovered—reported by a resident of Chaneyville, on March 10, 1927.

SOUTH CAROLINA

MALLARD:—

One female, banded in 1917, was shot at the Kinloch Gun Club, on the abandoned rice fields seventeen miles south of Georgetown, on January 23, 1919.

One female, named Mary Mulberry, banded on July 14, 1919, left in August, 1919, and was killed on the Edisto River, at Wiltown, forty miles from Charleston, on January 3, 1920.

One was killed on the marshes of the Santee Club, Santee Post Office, on December 16, 1919.

One female, banded in the fall of 1925, was killed upon Greenville City Water Works Reservoir No. 5, Greenville, on December 10, 1925.

BLACK DUCK:—

One, named Katie, banded on December 10, 1909—the first bird banded by Mr. Jack Miner—was killed on Rocky River, near Anderson, on January 17, 1910.

One, banded in 1916, was killed in "Hobcaw Barony" Marsh near Georgetown, on the Atlantic Ocean, sixty miles north of Charleston, on January 1, 1917.

CANVAS-BACK:—

One, banded in 1916, was killed in a small marsh near Gilden Creek, near Ready River, two miles north of Huntersville and two west of Cathville, on February 9, 1917.

DUCK:—

One female was killed in the Boozie Pond, on a farm at Hawthorne, Aiken County, on November 25, 1922.

CANADA GOOSE:—

One male was shot at a Club in South Carolina, on January 7, 1923.

One, banded in the fall of 1925, was killed by a resident of Liberty Hill, on January 2, 1926.

One, banded in 1925, was shot in the Beaver Creek Section, Kershaw, in the week of January 25, 1926.

One was shot in an oat field at Jacksonboro, shortly before November 30, 1925.

One, banded in the fall of 1926, was killed on Broad River, near Columbia, Richland County, on January 29, 1927.

SOUTH DAKOTA

MALLARD:—

One male, banded in 1919, was shot by a resident of Crandall, on October 13, 1922.

One was recovered at Lake Preston, on September 17, 1920

TENNESSEE

MALLARD:—

One was killed by a resident of Martha, Wilson County, on February 15, 1912.

One was caught in a steel trap by a resident of LaVergne, on January 1, 1922.

One male, banded in the fall of 1925, was killed on Lower Reelfoot Lake, in Western Tennessee, on December 16, 1925.

One, banded in the fall of 1925, was killed on the Little Tennessee River, near Tuskegee Farm, thirty miles south of Knoxville, on January 8, 1926.

DUCK:—

One, banded in 1914, was shot at Cooksville—reported in 1923.

One, banded in 1915, was killed on Duck River, in Bedford County, near Shelbyville—reported January 14, 1917.

One, banded in 1915, was killed on Sale Creek Shoals, Tennessee River, in January or February, 1917.

One was captured and later died in the County of Overton, on February 15, 1915.

One, banded in 1917, was shot on the Obion River bottom, near Kenton—reported January 1, 1918.

One was shot on the Tennessee River, by a resident of Birchwood, on January 27, 1917.

One, banded in 1917, was killed by a resident of Cookeville, on November 28, 1917.

One was killed on the Tennessee River, about twenty-five miles below Chattanooga, in the mouth of Mullins Creek, on December 19, 1917.

One was killed in Lauderdale County, on Forked Deer River, two and one-half miles from Gates, on January 11, 1923.

CANADA GOOSE:—

One, banded in the fall of 1925, was killed at Kenton, on December 28, 1925.

One, banded in the fall of 1925, was killed on a farm four miles west of Kenton—reported December 30, 1925.

One, banded in the fall of 1926, was killed on a sandbar formed by the Mississippi River, by a resident of Tiptonville—reported January 9, 1927.

Three were killed by a resident of Polk—reported January 16, 1926.

One was shot, slightly wounded and captured at Chapel Hill—reported November 23, 1926.

TEXAS

DUCK:—

One was shot on a farm a few miles from Crowley, Texas (?)—reported April 16, 1927.

VIRGINIA

MALLARD:—

One was killed at Saluda, on January 12, 1912.

One was killed on a farm two miles south of Williamsville, in Bath County, on December 10, 1917.

One, banded in the fall of 1925 (?), was killed near Caret (?), on January 11, 1926.

DUCK:—

One, banded in 1917, was killed in a pond at Sweet Hall, King William County, about twenty-nine miles east of Richmond, on December 15, 1917.

One, banded in 1917, was killed on Passage Creek, near Waterlick, Warren County, on December 22, 1923.

One was killed on Smiths River, two miles south of Martinsville—reported February 21, 1917.

CANADA GOOSE:—

One, banded in the fall of 1918, was captured and kept as a decoy at Back Bay, in the spring of 1919.

One, banded in the spring of 1922, was found just north of Tangier Island, Chesapeake Bay, on March 28, 1923.

One, banded in the fall of 1922, was killed at the Currituck Shooting Club, Cape Henry, on November 13, 1923.

One, banded in the fall of 1922, was killed about twelve miles below Fredericksburg, on the west side of the Rappahannock River, Caroline County—reported December 2, 1923.

Two were captured about eight miles off Cape Charles, on November 3, 1922. They joined some tame geese and were still there on December 18, 1922.

One, banded in 1923, was killed at Kittywan Club, on James River, on January 30, 1924.

One was recovered—reported by a resident of South Norfolk, on November 8, 1923.

One was killed in Currituck Sound, on November 12, 1923.

One was recovered in Back Bay—reported November 20, 1923.

One was shot on November 20, 1923—reported by a resident of Norfolk.

One was shot in Back Bay—reported December 15, 1923.

One was found with a broken wing and was cared for near Berryville—reported March 5, 1924.

One was captured alive on a small stream near Danville, southern part of Virginia—reported March 31, 1924. It had an injured wing.

One, banded in the fall of 1925, was killed on "Clifton" farm, Cartersville, on February 15, 1926.

One, banded in the fall of 1925, was accidentally caught in a trap and had its band removed—reported by a resident of Remington Post Office, Fauquier County, on March 3, 1926.

One, banded in the fall of 1925, was found dead in a trap on the Rappahannock River, by a resident of Remington, Fauquier County—reported March 3, 1926.

One, banded in the fall of 1925, was killed by a resident of Chance Post Office, Essex County—reported November 29, 1926.

One, banded in 1925, was killed on the Hop Yard Farm, on the north side of the Rappahannock River, in King George County, about fifteen miles east of Fredericksburg, on December 6, 1926.

One male was shot at Sand Bay, which is a part of Back Bay, on November 19, 1925.

One, banded in the spring of 1926, was killed at Dudley's Island Ducking Club, Back Bay, on January 4, 1927.

One female was killed—reported by a resident of Staunton on March 3, 1926.

One was shot—reported by a resident of Galax, on March 3, 1926.

One was killed on the Rappahannock River, on November 10, 1926.

One was killed on River Dale Farm, on the Rappahannock River, on January 6, 1927.

One was killed on the James River near Fort Powhatan, between City Point and Fairmouth—reported January 30, 1927.

WEST VIRGINIA

DUCK:—

One was killed in the Ohio River, at Ravenswood, on January 8, 1916.

CANADA GOOSE:—

One was found dead on a farm at Halltown—reported February 19, 1926.

SPECIES UNKNOWN:—

One was shot by a resident of Mahone—reported April 2, 1922.

WISCONSIN

MALLARD:—

One male, banded in 1916, was killed at Rush Lake, on September 7, 1917.

One male, banded in 1917, was killed in Chipewa County, about sixty miles east of St. Paul, Minnesota, on September 27, 1918.

DUCK:—

One was shot on Hever Marsh, in Lake Poygan,

situated west of Winnebago County, shortly before November 11, 1918.

One, banded in the spring of 1925, was shot at Rush Lake—reported September 25, 1927.

KINGSVILLE, ONTARIO

CANADA GOOSE:—

One, banded in the fall of 1924, was re-captured on December 4, 1927.

One, banded in the fall of 1925, was found dead—reported November 28, 1927. The bird probably died from shot injuries.

Three, banded in the fall of 1925, were re-captured on December 4, 1927.

Nine, banded in the fall of 1926, were re-captured on December 4, 1927.

One hundred, banded previous to the fall of 1927, were observed on November 13, 1927. On this day Mr. Miner noted that one hundred Canada Geese, out of five hundred observed, wore his bands.

NORTHWEST TERRITORIES

CANADA GOOSE:—

Four were killed on the Belcher Islands, Hudson Bay—reported in the summer of 1927.

SPECIES UNKNOWN:—

One, banded in the fall of 1925, was recovered at a place between Nottingham Island and Eric Cove, about the middle of September, 1927.

ONTARIO

CANADA GOOSE:—

One, banded in the fall of 1925, was shot by a resident of Dungannon, shortly before November 26, 1927.

One, banded in the fall of 1927, was shot on the shore of Lake Huron, between Amberley and Kintail, Huron County—reported November 28, 1927.

Two were killed in the spring of 1927—reported by a resident of Moose River, James Bay.

QUEBEC

CANADA GOOSE:—

Two, banded in the spring of 1922, were recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

One, banded in the fall of 1922, was recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

Three, banded in the spring of 1923, were recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

One, banded in the spring of 1924, was recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

One, banded in the fall of 1925, was recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

Ten, banded in the spring of 1926, were recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

One, sent on May 6, 1926, to the Experimental Farm, Ottawa, Ontario, was banded by A. G. Taylor for Hoyes Lloyd with Biological Survey band No. 202,138, on August 3, 1926, had left the Farm by December 4, 1926, and was killed in Seven Islands Bay, Saguenay County, Quebec, on September 17, 1927.

Five, banded in the fall of 1926, were recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

Five, banded in the spring of 1927, were recovered—reported by a resident of Fort George, James Bay, on September 3, 1927.

Five were killed on the coast of Hudson Bay, near Great Whale River—reported during the summer of 1927.

SPECIES UNKNOWN:—

One, banded in the fall of 1925, was killed—reported by a resident of Port Harrison, Hudson Bay, in 1927 before November 10th.

Two, banded in the fall of 1926, were killed—reported by a resident of Port Harrison, Hudson Bay, in 1927 before November 10th.

One, banded in the spring of 1927, was killed—reported by a resident of Port Harrison, Hudson Bay, in 1927 before November 10th.

Eight were recovered—reported by a resident of Fort George, James Bay, on March 2, 1927.

ARKANSAS

CANADA GOOSE:—

One, banded in the fall of 1926, was killed on the Arkansas River, twenty-five miles south-east of Little Rock, on December 21, 1927.

ILLINOIS

MALLARD:—

One, banded in the fall of 1925, was killed at the Grand Island Lodge, a shooting preserve on a large island in the Illinois River, opposite Bath, on November 26, 1927.

CANADA GOOSE:—

One, banded in the fall of 1925, was shot on the property of the Island Club, along the Mississippi River, about eighteen miles north-west of Cairo, on November 15, 1927.

One, banded in the fall of 1925, was killed on the Kimmel Bar, in the Mississippi River, about midway between Cape Girardeau, Missouri, and Grandtower, Illinois, on December 24, 1927.

One, banded in the fall of 1925, was killed by a resident of Valmeyer, on December 27, 1927.

One, banded in the spring of 1926, was shot by a resident of a place two miles south of the Wisconsin line, and two and three-quarter miles from Hebron—reported December 12, 1927.

One, banded in the fall of 1926, was killed—reported by a resident of Jonesboro, on October 31, 1927.

One, banded in the fall of 1926, was killed on a bar in the Mississippi River, near Cairo, on December 3, 1927.

One, banded in the fall of 1926, was killed at Newton, shortly before December 10, 1927.

One, banded in the fall of 1926, was shot in the wing by a resident of Clay City, on December 24, 1927. The bird was being kept in captivity.

One, banded in the fall of 1926, was killed—reported by a resident of New Haven, on December 26, 1927.

One, banded in the fall of 1926, was killed—reported by a resident of New Haven, on December 26, 1927.

One, banded in the fall of 1926, was shot on the Mississippi River, eighteen miles north of Cairo, on December 30, 1927.

INDIANA

CANADA GOOSE:—

One, banded in the fall of 1925, was killed in Lake County, near Crown Point, on November 28, 1927.

KENTUCKY

CANADA GOOSE:—

One, banded in the fall of 1925, was killed on a sandbar along the Mississippi River, three miles south of Columbus, Hickman County, on November 11, 1927.

One, banded in the fall of 1925, was shot by a resident of Hopkinsville, Christian County, on November 23, 1927.

MARYLAND

CANADA GOOSE:—

One, sent on May 6, 1926, to the Experimental Farm, Ottawa, Ontario, was banded by A. G. Taylor for Hoyes Lloyd with Biological Survey band No. 202143, on August 3, 1926, had left the Farm by December 4, 1926, and was shot at Galena, Kent County, on December 29, 1926.*

MICHIGAN

CANADA GOOSE:—

One, banded in the fall of 1925, was shot at a place three miles north of Holland, on December 23, 1927.

MISSOURI

CANADA GOOSE:—

Three, banded in the fall of 1926, were recovered at a place about ten miles south of Commerce, Scott County, on December 27, 1927. Two were killed and one crippled and kept in captivity.

NORTH CAROLINA

CANADA GOOSE:—

One, banded in 1925, was killed on the Reedy Fork River—reported December 1, 1927.

One, banded in the fall of 1925, was shot at Currituck Sound, on November 22, 1927.

One, banded in the spring of 1926, was killed in Crains Shooting Club, in Currituck Sound, on November 4, 1927.

One, banded in the spring of 1926, was killed at Mattamuskeet Lake, near the coast, on November 14, 1927.

One, banded in the spring of 1926, was killed at Currituck Sound, on November 22, 1927.

One, banded in the spring of 1926, was killed in Grandy, on November 28, 1927.

One, banded in the spring of 1926, was killed at Currituck Sound—reported December 11, 1927.

One, sent on May 6, 1926, to the Experimental Farm, Ottawa, Ontario, was banded by A. G. Taylor for Hoyes Lloyd with Biological Survey band No. 202,144, on August 3, 1926, had left the Farm by December 4, 1926, and was killed at Poplar Branch, on January 10, 1927.

Two, banded in the fall of 1926, were shot at Mattamuskeet Lake, Hyde County, near Pamlico Sound, on November 1, 1927.

One, banded in the fall of 1926, was shot at

*C.F.N., XLI, 1917, p. 170.

Gull Shoals Club in Gull Island, Pamlico Sound, about forty miles north of Cape Hatteras, on December 5, 1927.

One, banded in the spring of 1927, was shot by a resident of Engelhard, on November 1, 1927, and reported as a male.

One, banded in the spring of 1927, was killed at Currituck Sound, on November 1, 1927.

One, banded in the spring of 1927, was shot, and wounded slightly at Currituck Sound, on November 16, 1927. The bird was recovering and being kept as a decoy.

One, banded in the spring of 1927, was killed at Currituck Sound, on November 17, 1927.

One, banded in the spring of 1927, was shot at Mattamuskeet Lake, Hyde County, on November 21, 1927.

One, banded in the spring of 1927, was killed on Currituck Sound, near Jarvisburg, on November 29, 1927.

One, banded in the spring of 1927, was killed by a resident of Salvo, Dare County, on December 5, 1927.

OHIO

CANADA GOOSE:—

One, banded in the fall of 1926, was killed at the Grand Reservoir, Celina, on November 9, 1927.

One, banded in the fall of 1927, was shot at Lake St. Marys, on December 17, 1927.

One, banded in the fall of 1927, was shot by a resident of Celina, on December 20, 1927.

SOUTH CAROLINA

BLACK DUCK:—

One, banded in the fall of 1917, was recovered by a resident of Daufuskie Island, on December 9, 1927.

CANADA GOOSE:—

One, banded in the fall of 1925, was killed on the Wateree River, eighteen miles east of Winnsboro, on November 30, 1927.

One, banded in the spring of 1927, was killed by a resident of Darlington, on November 7, 1927.

One, banded in the spring of 1927, was shot in South Carolina, during the week of November 28, 1927.

TENNESSEE

CANADA GOOSE:—

One, banded in the fall of 1926, was killed on Darnell Bar, about two miles from Tiptonville, in the Mississippi River, on November 21, 1927.



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The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first was *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July, and August. Its scope is the publication of the results of original research in all departments of Natural History.

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"If the average man would but put aside for the time his lust for gold, and for a few hours each week become a devotee to nature, his life might be many fold the better and his contentment greater."

NOTES ON THE BIRDS, ORCHIDS, FERNS AND BUTTERFLIES OF THE PROVINCE OF QUEBEC, 1927

By HENRY MOUSLEY



IN THE PRESENT PAPER, it is proposed to carry on the notes of 1926, which left off, I find, on September the 6th, according to the November number of *The Naturalist* for that year. Possibly, to those having but one interest in the natural sciences, the season of 1927 will go down as a very poor one indeed, but not so in my case, for with so many strings to my bow, it would have to be an exceptionally bad year indeed, before I could draw an absolute blank, for no matter how wet or late the season may be, it is almost sure to suit one or other of my special leanings, as was the case in the present season, for although, an indifferent bird and butterfly year, it was certainly a fern and orchid one, and this was so in England also.

Probably, the migrations of the birds form the principal attraction of early spring, my account of the love song and flight of the Woodcock (*Rubicola minor*) in April and May, having already appeared in the November number of *The Naturalist*. Personally, no nests of this bird were found, and I had very poor luck with those of Wilson's Snipe (*Gallinago delicata*), nothing but broken eggs being found on two occasions. This is often the case, not only with this bird, but that of the Woodcock also, so that photography becomes a very uncertain and disappointing business.

Another early nester is the Killdeer (*Oxyechus vociferus*), with which, however, I had better luck, obtaining several nice pictures of their nests and eggs. On the seventeenth of April, in company with my friend, Mr. L. M. Terrill, we obtained, at Chambly, probably the earliest record known in these parts for the Pine Warbler (*Dendroica vigorsii*), and on the same day, saw the first example for the year, of the little Azure Blue (*Lycænopsis pseudargiolus*). Speaking of the first named, Wintle in his *Birds of Montreal*, 1896,

describes the Pine Warbler as a transient visitant—scarce. I was fortunate, on June 18th, in being able definitely to add it as a breeding species in the district, for I watched a pair of birds feeding their young, in a nest situated fifty or sixty feet up on the branch of a large pine tree, in the grounds of Victoria farm, belonging to Mr. T. B. Macaulay at Hudson Heights, and again, later on, a nest was seen at Chambly, and there is little doubt, I think, but that it breeds also in the large pine woods at Oka. I visited these woods on May 8, taking for the first time some examples of the little Banded Elfin butterfly (*Incisalia nippon*), which was just coming out at the time. Later in the season, when again in the district, I visited a small swamp which produces all kinds of nice things in the orchid line, such as white blooms of the Showy Lady's Slipper (*Cypripedium reginæ*), Small Round-leaved Orchis (*Orchis rotundifolia*), Tall White Bog Orchis (*Habenaria dilatata*), Small Green Wood Orchis (*Habenaria clavellata*), Large Round-leaved Orchis (*Habenaria orbiculata*), White Fringed Orchis (*Habenaria blephariglotis*), Arethusa (*Arethusa bulbosa*), White blooms of Pogonia (*Pogonia ophioglossoides*), Calopogon (*Calopogon pulchellus*), and Hooded Ladies' Tresses (*Spiranthes Tomanzoffiana*). Other interesting plants include the Adder's Tongue (*Ophioglossum vulgatum*), Common Grape Fern (*Botrychium obliquum* and *B. dissectum*), and at Mt. St. Alexis the Maidenhair Spleenwort (*Asplenium Trichomanes*), and Rusty Woodsia (*Woodsia ilvensis*).

It is not often that one finds the White-throated Sparrow (*Zonotrichia albicollis*) victimized by the Cowbird (*Molothrus ater ater*), but such was the case on May 22, when at St. Martin's Junction, I found a nest containing four eggs of the owner and one of the Cowbird. Another interesting nest was that of the Rose-breasted Grosbeak

(*Zamelodia ludoviciana*), found at Verdun on June 3, containing four eggs, on which the male was sitting. On this same day also, nests of the Virginia Rail (*Rallus virginianus*), Song, and Swamp Sparrows (*Melospiza melodia melodia*, and *M. georgiana*) were found, the two latter each containing a Cowbird's egg—which reminds me, that so far as my experience goes the present year has been an abnormal one for the finding of this bird's eggs. Two days later, or on June 3, Mr. Terrill found a station for the rare little Ram's Head Lady's Slipper (*Cypripedium arietinum*) near Chambly and, later on, another was found by myself some few miles from the first one. On the eleventh of the same month—thanks to the kindness of a friend—I had the pleasure of seeing it again near Terrebonne. This rare little orchid was first collected in Canada near Montreal, before 1808. In that year it was transplanted to English gardens by Messrs. Chandler and Buckingham, where for some time it was known as Chandler's *Cypripedium*. Another interesting little orchid, and one which grows in close proximity to the Ram's Head, near Terrebonne, is the Striped Coral Root (*Corallorrhiza striata*), this being the only known station for it in the Province of Quebec, so far as I am aware so that I was indeed fortunate to have seen them both in perfect bloom, on one and the same day. Another interesting find—a week earlier—by my friend Mr. Napier Smith—in whose company I happened to be at the time—was that of a nest of the Northern Water Thrush (*Seiurus noveboracensis noveboracensis*), containing four young birds just out of the shell, and one egg. The nest was situated on a mound near stagnant water, not so very far from the site of the two little orchids mentioned above. On this same ground, but nearly a month later, I found a very large station for another little orchid, the White Adder's Mouth (*Malaxis monophyllos*), or as it should now be called, *Malaxis brachypoda* (Uray), Pern. It is not often that a change in name has much to recommend it, but according to Prof. Fernald (*Thodora*, 1926) there seems every justification for it in the present instance. Quoting from the above Journal, Prof. Fernald says (l.c. p. 94): "When we first came across the plant, in Newfoundland, confined to the limestones of the West Coast, it was only in bud, but later a good series in flower was secured, including occasional individuals with two leaves instead of the conventional solitary one. And the most interesting thing about it is that, when the plants are carefully studied, although they are quite like the plant of continental eastern America, they stand out from the Eurasian *Malaxis mono-*

phyllos on practically every character. Most significant is the fact that the Eurasian plant has the flowers resupinate or up-side-down, so that the lip points up; while in the plant of eastern America the flowers are in normal position, with drooping lip. Asa Gray recognized this difference in 1835 when he described the American species as *Microstylis brachypoda*. Subsequent students of the orchids seem to never have compared the flowers of these plants, and for ninety years Gray's youthful discovery has been quite overlooked, even the name, which appears in *Index Kewensis*, being ignored in Ame's *Enumeration of the Orchids of the United States and Canada*," and (l.c. p. 376): "overwhelmed apparently by the opinions of Hooker, Lindley, and Torrey, he (Asa Gray) abandoned his species and so far as I can find, no one has subsequently suggested that our plant and the Eurasian are not identical. The two are, however, thoroughly distinct." Regarding the mention above of occasional plants with two leaves (*myforma bifolia*), I take it, that the second leaf in these was above the normal one, which is the usual thing in cases of this kind. However, I was fortunate enough on July 20 to find one plant in which the second leaf was below, instead of above the normal one, and previously, on the 8th of the month, near St. Hippolyte, in the Laurentians, I came across a similar example, only in this case it was in an allied species, the Green Adder's Mouth (*Malaxis unifolia*), both of which—with illustrations—have been recorded in *The Orchid Review* for December, 1927, pp. 356-58. At this same time, and place also, I became acquainted with two little butterflies new to my list, one, the Greenish Blue (*Plebius saepiolus*), and the other, the Plain Ringlet (*Canonympha inornata*). It is not so many years ago, that the finding of these two species in the Laurentians came as somewhat of a surprise to most entomologists. Certainly, I got a thrill botanically, when after taking these two little butterflies, I came upon two beautiful plants in bud, of my forma *monotropoides* of *Amesia* (*Epipactis latifolia*, or the Broad-leaved Epipactis, thus extending the range of this white form some twenty miles further north of the previous known station, St. Francois de Sales (see my paper "The Genus *Amesia* in North America", *The Canadian Field-Naturalist*, Vol. XLI, January and February, 1927).

Reverting to the beginning of the month, on July 1st and 2nd, at Chambly we came upon some lovely Large Purple Fringed Orchids (*Habenaria fimbriata*), or, as Thoreau calls them, "Belles of the Swamp", which were in prime

condition and spread over a large area. On the second of these dates, I had my first really good view of a male and female Mourning Warbler (*Oporornis philadelphia*), both chipping loudly, as we searched in vain, for their nest or young. I had only once previously seen these warblers at Hatley, where they are very uncommon. Another interesting episode on this same day, was the photographing of a Ruby-throated Hummingbird's (*Archilochus colubris*) nest, which Mr. Terrill had found some few weeks previously, the nest being situated right out in the woods, on the top of a slender branch of a young maple tree, about 40ft. above the ground. Other birds photographed on this and previous visits were young of the Marsh Hawk (*Circus hudsonius*), Long-eared, and Saw-whet Owls (*Asio wilsonianus* and *Cryptoglaux acadica acadica*), the last named having their home in the hole of an old basswood tree, and it was whilst taking their pictures, that I found the second station for the little Ram's Head Lady's Slipper, already alluded to.

On the day following the finding of *Malaxis brachypoda* with the second leaf below that of the normal one, I left home for Hatley, and Ayer's Cliff, arriving at the former place on July 21. Visits to some of my old haunts produced fine examples of the Large Round-leaved Orchis (*Habenaria orbiculata*, and *H. macrophylla*), several pure white, Small Purple Fringed Orchis? (*Habenaria psycodes*), Hooded and Slender Ladies' Tresses (*Spiranthes Tomanzoffiana*, and *S. gracilis*), whilst in the great swamp at Beebe, the Tall White Bog Orchis (*Habenaria dilatata*) was just coming out, with two examples of the var. *media*. *Pogonia* and *Calopogon* were out also, with one example of the former bearing two blooms, the second one, not above the normal one, as is usual in cases of this kind, but away down below it, in fact, in the centre of the single oval or lance-ovate leaf, near the middle of the stem. I have already referred to pure white blooms of this species having been found near Oka. The little Horned Bladderwort (*Utricularia cornuta*) was in great profusion, and the Least Copper butterfly (*Heodes epixantha*) was there also, but not in its usual numbers. A surprise came on July 29 when, in a mowing field, I found a single example of the Ragged Fringed Orchis (*Habenaria lacera*), making the third only of this species that I have taken round Hatley in seventeen years. The special locality for the Green Adder's Mouth (*Malaxis unifolia*) produced two more examples of the forma *bifolia*, one, an exceptionally fine specimen, with the second leaf fully expanded, inside of, and almost as large as, the normal one (see central figure in the

illustrations already referred to in *The Orchid Review*). The greatest surprise of the visit, however, is connected with the ferns—especially the *Botrychium* group—not at Hatley, but at Ayer's Cliff, about six miles away, at which place I spent the latter part of my visit, from August 5-13. Here, on some rocky bluffs covered with cedars, I found the form of the Moonwort known as *Botrychium onondagense*, the Matricary, and Little Grape Ferns (*Botrychium ramosum*, and *B. simplex*) all growing together in great profusion, with some very interesting apparently intergrading forms. It wanted only one other little species—for which I had been searching in vain for years—to fill my cup of luck to overflowing, and that was the Lance-leaved Grape Fern (*Botrychium angustisegmentum*), of which there are only three records for the district, all on the shores of Lake Memphremagog, but these date back some forty years or more. However, luck was to come my way later on, after my return home to Montreal, but more of this anon. In the meantime it would be premature in the present paper to try and discuss exactly what new forms or species I may have gathered, considering that the genus *Botrychium* is a highly specialized and plastic one and much further study, more especially of the spores, perhaps is necessary before we can form any adequate idea as to where exactly one species leaves off and another begins. It is gratifying to know, however, that the spore identification question is being taken up by Bro. Victorin, who by this method is describing one new species he discovered in the Mingan Islands last year (1926), and which occurs at Hatley also, from an examination of the spores of specimens taken by me in 1924 and 1925, and even earlier, namely, 1920. These were at the time ascribed to *Botrychium onondagense*, in lieu of anything nearer or better, although they are very much smaller and differ considerably from the only typical example of that species taken at Hatley last year on June 12, 1926, and the present ones from Ayer's Cliff, which agree with the last named example in every respect.

In addition to all the above, I came across one fair-sized root of the Maidenhair Spleenwort (*Asplenium Trichomanes*), this being the second station only for the species that I know of in the district, the other being at Coaticook, some fifteen miles away. I also visited the small station—second only for the district—for the Narrow-leaved Spleenwort (*Athyrium angustifolium*), and the one for the rare little Smooth Woodsia (*Woodsia glabella*), which I regret to say seems in poor shape. The plants were badly

dried and shrivelled by the sun; and the little colony was much depleted, owing to the disintegration and sliding away of the rock above.

The bird census of the trip revealed 77 species, of which two records stand out prominently, the first, the watching of an adult Northern Bald Eagle (*Haliaeetus leucocephalus alascanus*), circling in majestic style over Lake Massawippi, and the second, the sight, not of a living bird, unfortunately, but nevertheless, of a beautifully mounted example of a Duck Hawk (*Falco peregrinus anatum*), which was shot on the eastern shore of this same lake in April, 1927, the bird being new to my list, and bringing the total up to 194 species for Hatley and district, (see *The Auk*, Vol. XLIV, 1927, No. 4, pp. 520-23). Although it was somewhat late in the season, I found nests, some with eggs, others with young, of the Phoebe (*Sayornis phæbe*), Alder Flycatcher (*Empidonax traillii alnorum*), Goldfinch (*Asragalimus tristis*), White-throated Sparrow (*Zonotrichia albicollis*), Chipping Sparrow (*Spizella passerina passerina*), Cedar Waxwing (*Bombycilla cedrorum*), Robin (*Planesticus migratorius migratorius*), and Hermit Thrush (*Hylocichla guttata pallasi*). The two most interesting birds among the more uncommon species, were a male Indigo Bunting (*Passerina cyanea*), and a female Scarlet Tanager (*Piranga erythromelas*)—the latter, a very sober coloured individual, when compared with her brilliant mate; their nest and eggs are still desiderata.

It was the middle of August before I returned to Montreal, only to find the Broad-leaved Epipactis (*Amesia latifolia*) practically over, this being the second season in succession, that I have missed seeing this orchid in flower. However, I was to be compensated in another way for on looking over a batch of Botrychiums that Mr. Terrill had found at Chambly, I was able to detect two examples of that one little species—already alluded to—that had baffled all my previous efforts to locate, and even now was no cinch, for the finder, not knowing the prize he had obtained—there is no record, whatever, for the Montreal district, indeed, for the Province, except the three already mentioned along the shores of Lake Memphremagog, and perhaps one other in Canadian Labrador—seemed dubious of being able to locate the exact spot again, in woods that extended for miles. Kind readers, imagine the suspense I was in until the end of the month (Aug. 28), when, in company with my friend, we repaired to those same woods once more, and after a good deal of searching, I, at last, had my first view of the little Lance-

leaved Grape Fern (*Botrychium angustisegmentum*), growing in its native element. There was no mistake about it, for apart from the principal character that separates it from the other small Botrychiums, the sessile frond, the darker shade of its foliage alone—to a practised eye—was sufficient to mark it out from *Botrychium simplex* and *B. ramosum*, most of which were then on the wane, whilst *B. angustisegmentum* was in prime condition, and continued in evidence even up to the middle of October, and later, long after the other two had ceased to exist. It extended over a wide area at Chambly, but was found nowhere else, although *B. obliquum*, *B. dissectum*, *B. silaifolium*, *B. simplex* and *B. ramosum* were found at many places twenty miles north of the city, Chambly being twenty miles south of it. The specimens as a rule were small, my first example—which was our record, I believe—measuring 23 cm., probably having taken over twenty years to attain this height.

On September the eighteenth, I was at St. Andrews, Que., in company with other friends, the chief finds being the Narrow-leaved Spleenwort (*Athyrium angustifolium*), Goldie's and Clinton's ferns (*Thelypteris Goldiana* and *T. cristata* var. *Clintoniana*), the first two of which I also found at Cartierville, on the 27th. At the latter place, several Woodcock were flushed when looking for these ferns, whilst, at the former, we had the pleasure of watching a bumble bee force its way into a flower of the Closed or Bottle Gentian (*Gentiana Andrewsii*), a proceeding which seemed almost impossible, in view of the construction of the flower. This species is very plentiful at Chambly, where grows also the Cardinal flower (*Lobelia cardinalis*), but in one restricted spot only. It was there, on October 2, that great numbers of the Common Sulphur Butterfly (*Colias philodice*) were flying over the clover, on which the females lay their eggs, the white form of this sex, being particularly numerous at the time, which is often the case, especially in the third brood.

My most interesting find on Mt. Royal this season, was the Rusty Woodsia (*Woodsia silvensis*), but this was overshadowed by that of Mr. Terrill, who located a few examples of the Slender Cliff Brake (*Cryptogramma Stelleri*), a much rarer species. The Common Polypody (*Polypodium virginianum*), I now find, grows quite commonly, at the eastern end of the mountain. My last visit to the woods for the season was at St. Rose, on November 20, for the express purpose of securing plants of Loesel's Twayblade (*Liparis Loeselii*), to compare the development of the new bud for 1928 with that of some White Adder's

Mouth (*Malaxis brachypoda*), which I had taken just previously near Terrebonne. And so ended the season of 1927, a season full of pleasant memories and interesting finds, which latter still remain to be critically examined during the long and dreary winter months, until once again, the

spirit moves us, and we seek the old familiar trysting places, where, perchance, under a soft and silvery moon, we may yet again witness the sky dance, and listen to the love song of the Woodcock, as he volpanes to earth, and his mate.

LACUSTRINE LITTORAL FORMS REFERABLE TO ICE PRESSURE

By GERALD JARVIS

MOTORISTS and others who travel out from the fertile plain which flanks the Lower Ottawa river toward the rugged Laurentian upland traverse slopes covered with stony soil and partly under cultivation, where may occasionally be seen clearings enclosed by walls of boulders having a height of perhaps four or five feet and width somewhat greater. It is apparent that behind these labour devouring substitutes for fences lies the motive of ridding the soil of objects which impede the passage of the plough, but the satisfaction of thus connecting an observed fact with a convincing explanation is likely to be disturbed in those invaders of the great open spaces who encounter for the first time structures, resembling in form and composition those described in this paper, which delimit areas not of pasture or grain field but of water. A thought of dykes along the Zuyder Zee or the levees of the Mississippi is likely to flash through the observer's mind before he realizes that these walls which border certain lakes are not the work of human hands. They are composed of littoral material which has been thrust landward by the expansion of the ice. But again occurs a puzzling afterthought; for while ice forms each year with unfailing regularity on our lakes and streams the particular consequence which has been mentioned cannot be called common.

Phenomena connected with the subject occur at several points in Renfrew County, Ontario, one of them being Lake Clear. This interesting sheet of water is roughly elliptical in form, its major axis having an approximately NW-SE trend and a length of six miles. It lies in a deep rock basin the walls of which generally pitch steeply and in places precipitously to the water, but at the west end where both the chief affluent and the discharge occur there is an extensive sand plain, probably a delta deposit dating from a time when the drainage of the region was glacially regulated. When seen from a boat, the only practicable way, the shores of the lake present a strikingly firm and clean appearance. There is a notable absence of a condition very

common in the smaller Laurentian lakes where low wet land meets shallow water along a line hidden by reeds and other aquatic vegetation. Even where the shores are low they usually present a serried front of boulders rising sharply from the water and commonly capped with vegetation. It is this screen of trees which conceals the fact that in places the shore seen is a barrier behind which lies a swamp bounded otherwise by the original shore line. It may be said in a roughly generalising way that minor recessions in the original shore line have been walled off, the enclosed areas being in process of conversion to dry land by the accumulation of swamp deposits. The lake, so to speak, is intolerant of shallows. When the depth of water does not exceed that at which the ice at its maximum thickness comes in contact with the ground, and the nature of the shore and other conditions are such as to bring about a landward movement of the ice, this movement is communicated to detachable material on the lake bottom which is thrust shoreward and upward until it rises above water level. Regarding the termination of this process it is apparent that the resistance in front of the ice increases with the accumulation of material transported by it, that a further increase of resistance accompanies the widening of the zone of contact between the lower surfaces of the ice and the ground which results from the shoaling of the water, and that the ice being insufficiently plastic to accommodate itself under pressure to minor irregularities in the shore line exhausts its force in increasing degree on the salients as its front advances in the recentrants.

Those accustomed to cross the frozen surface of a lake have often heard beneath their feet a sound somewhat resembling the snapping of a bass violin string immensely magnified. The known thickness of the ice is usually reassuring and the traveller can confidently connect the sound with some readjustment of tensions to which his weight does not contribute. I was once at Lake Clear when this process attained a degree of activity which subsequent enquiry has led me to think quite exceptional. A friend

and I spent a week there late in December, 1919. A thaw which was in progress on the day of our arrival removed all but a trace of snow and then the weather turned extremely cold, remaining so for three or four days. We had no thermometer but the intensity of the frost was indicated in the difficulty with which we kept open the hole through which our water supply was drawn from the lake, and the poor success attending our efforts to keep the cottage comfortably warm. Then to increase our discomfort Nature lifted up her voice in tones more dismal than I had known her to possess. The lake groaned, it growled, and it even roared. Day and night the noise did not cease but it was louder at night. It had some resemblance to distant thunder and some to the muffled sound of the sea heard through an open window but possessed a distinctive quality not to be indicated by these worn comparisons. Borne down by the wind from the West and off the lake came a confused mass of sound which was punctuated by distinct detonations nearer at hand. Those quite close had a progressive character corresponding with the idea of a crack developing across the field with incomparable speed. And it was in no inappropriate setting the Frost King has staged his *tour de force*. Up from the expanse of ice rending clamorously within his grasp rose for five or six hundred feet sombre hills of gneiss, the age of which rocks makes a jest of time. The place seemed inexorably shut off from human associations—a raw archaic world, void and without form, where the Titans could disport themselves at will.¹

My companion and I discussed the contrasted behaviour of ice in different localities. His home was a stone's throw from the shore of Lac des Chats, an espansion of the Ottawa River at that point two miles wide. He had never heard such sounds as now assailed our ears nor observed on the shores deposits attributable to movements of the ice. We considered features which distinguished the two lakes and their possible bearing on the subject. The expansive pressure of ice is sometimes relieved by rupture of the ice itself. Fissures form along which the opposing sheets arch upward. When a lake is traversed by a strong current, the ice gradually grows out from the shores and where it forms last it continues weakest. Accordingly when pressure ridges or

reefs, as they are sometimes called, form on the Lac des Chats, they are near the central parts. Again this lake is shallow, its shores dip beneath the water at a low angle entailing a relatively wide zone of contact between the ice and the ground which increases as water levels fall through the winter. Such disturbances of level produce fractures affording relief of pressure somewhat analogous to what occurs from movements from the tide on the sea coast. To state the case conversely a lake where strong pressure from the ice upon the banks is to be expected is one which freezes over quickly, which has a fairly constant winter water level and shores of a kind to confine contact with the ice near its margin. These conditions occur at Lake Clear and there is another to be mentioned. The lake is fed solely by small "spring creeks". The water of higher temperature, in winter, brought in by them causes areas of weakness in the ice near their points of discharge which are likely to yield, thus facilitating a general shoreward movement. The irregular form of Lake Clear, its islands, and the varying character of its shores with respect to resistance must greatly complicate any estimation of the landward movement of the ice based on the principle that expansion is proportionate to area. Not all the currents of pressure varying as they do in direction and intensity can become confluent to find peripheral discharge. But it can be said that where the material composing the shores of Lake Clear is such as to register ice pressure, evidence of it is seldom lacking. Probably three-fourths of the waterline lies on glacial till ranging in composition from fine earth to rock fragments measurable in cubic yards. Wave action on such deposits might be expected to develop gravel beaches or supposing the erosive action to be such as to remove all but very heavy material, a ragged shoreline of partly submerged boulders. Such features are, however, not often seen. Anything describable as a beach can hardly be found, apart from the few sandy areas, even at the season of low water. The lake, so to speak, always appears brim full. But probably the most significant circumstance is that the faces of boulder walls undoubtedly constructed by the ice are closely resembled by those developed on the drift deposits where, by reason of the inclination of the banks, the formation of walls is impossible. The heavy angular or sub-angular rock fragments ranged along the water's edge exhibit no stratification, but there is an absence of fine material which points to the sorting action of water while on the other hand the comparatively regular alignment of the stones does not accord with the idea of their having been scattered by the waves. An

¹ The April 1920 issue of *Discovery*, a magazine published in London, contained a contribution by Dr. Arthur Holmes, D.Sc., F.G.S., which was an exposition of the theory that the age of radio-active minerals can be determined by the degree of decomposition or transmutation they have undergone. A table was presented giving results of tests of 31 mineral specimens from various parts of the world. The oldest thing on earth, so far as these investigations went, is a zircon from Sebastopol, Canada, to which was ascribed an age of 1,580,000,000 years. Sebastopol is the township in which Lake Clear is situated.

explanation which suggests itself is that material too coarse to be transported in the season of open water beyond, that is to say, beneath reach of the ice is shoved landward in the following winter until in time and after many movements the fragments get into interlocking positions which approach permanency. There is something in the pattern of these structures which occasionally suggests rude masonry.

It was my original idea that while sandy and gravelly shores readily take the impress of the ice, structures of material so little coherent cannot long survive. What might seem confirmation of this view came to my notice last April. Ice covered the lake to within a few feet of the shore, but had disappeared from a sand beach near my camp leaving a vertical face about two and one-half feet high at the foot of which the ground exhibited a disturbed and dragged appearance. No trace of this remained when I next visited the place; a few hours or even minutes of open water might suffice to obliterate it. But the existence of a beach in that particular place excites question. It lies across a recession in the original shore line and from its crest about two feet above high water line, it dips backward into a swamp. A creek discharging near at hand may be supposed to have brought in the material composing it and the direction in which this was transported is perhaps referable primarily to the prevailing winds and corresponding movement of the water, but this does not, I think, explain the circumstance that the little bay was walled off and not filled from its apex. The position of the beach points to its having been built by the ice and since reaching this conclusion I have seen, on the north side of the Lake Clear near Turner's Island, a swamp shut in by a barrier composed principally of sand but having a section at one end made up of very heavy rock fragments piled in a manner strongly indicative of ice pressure. In such cases it is probable that the material has been shoved against the margins of areas of ice which, in very shallow recesses, adhere too firmly to the ground to move under pressure. Sometimes they do not rise with the water level in early spring and then there is typically developed a sort of monoclinical fold which may grow into an overthrust, the lower side being submerged. In such sheltered situations material is likely to accumulate from year to year until a new shore line is formed.

Manifestly an agency capable of breaking down minor salients, when not composed of bed rock, of walling in recessions and of forming at the water line deposits highly resistant to the erosive energies of wave and current may profoundly

influence the character of the shore, but it would appear that these processes can develop considerably without producing very distinctive results, and the seeming disparity between the occurrence of ice and features attributable to its expansive force is likely to be reduced when these become recognizable through study. A row of boulders at the water's edge is, for example, not an object to attract attention, but things insignificant in themselves may, on being thought of collectively, become mutually explanatory as referable to a common cause. It was only after frequenting Lake Clear for many years and rowing a skiff with a trolling line attached around its shores for some hundreds of miles in the aggregate that I realized these shores were unusual, and that the cause could be summed up in the word pressure. It may be added that when winter water levels do not vary much from year to year, the period of great activity in shore-building processes connected with ice may not be greatly protracted. On the one hand there is a depletion of moveable material and on the other a growth of resistance until the aggressive force is balanced. Some possible modifications of this rule are for the sake of brevity omitted. The appearance of the shores of Lake Clear and especially the normal attitude of large trees growing on ice-formed deposits, would indicate that no important disturbance has occurred recently. I have never seen there any evidence of higher post-glacial water levels. It is worth considering whether shore terraces recording extinct levels might not have been deformed beyond recognition by ice pressure, but the presence of a small esker on the north side of the lake which has particularly steep sides and its base at water level would suggest that the level has not been much higher since the basin became free of the glaciers.

Mr. J. B. Tyrrell, who kindly gave me an opportunity to read his paper *Ice on Canadian Lakes*,² states therein that he has many times examined the shores of lakes in Northern Canada without finding any evidence that they had been affected by expansive pressure of the ice. He further mentions that these lakes usually freeze over when still high from the autumn rains that subsequent precipitation is nearly all in the form of snow, the inflow of water is much reduced and lake levels sink so that the ice afloat is surrounded by an upward sloping belt of ice resting on the shore and frozen to it. The lack of evidence of pressure at the upper margin of this slope, which lies at or near the shore line as in summer constituted, seems explainable on the supposition

² *Can. Inst. Trans.* vol. 9, pp. 13—21, 1910.

that the belt does not transmit the expansive thrust of the floating ice and that results of pressure are confined to levels which are submerged with the rising of the ice during the spring flood. One might suspect when prominent geologists differ in opinion on such a subject the cause lies in climatic or other distinctive conditions prevailing in their respective fields of observation. Climate, for example, may be supposed to accentuate the fluctuation of water levels in the North and the usually thawless winters of those regions tend to envelop everything in a mantle of loose snow which in great measure insulates the ice from the changes of temperature on which the expansive process depends. But when we find, as in the Ottawa district, certain lakes which present no evidence of ice pressure on their banks, while others a few miles distant have these features developed in a striking and unmistakable way, considerations of climate are excluded. What distinguishes these lakes is that in the one case they are fed and drained by large streams and in the other they are not. Some reduction of water level after the ice has formed is probably general, but this is likely to be very small when the level, after the spring flood has passed, never rises more than a few inches above the barrier controlling outflow.

These remarks concern primarily the results of ice pressure, but a brief reference to causes would appear to be called for. Like many other subjects the behaviour of ice had to acquire economic importance—in connection with dam construction and other engineering problems—before attracting systematic study. Of late years the results of much observation of ice in nature and under experimental control has been recorded and a great deal of information of this kind has been kind was embodied in a report prepared for the St. Lawrence Waterways Project in 1926. It is plainly difficult to reproduce in a laboratory the influences affecting ice in nature and for the present these are not all known. The rule that ice expands and contracts with heat and cold does not teach us what to expect when the upper surface of a floating sheet has a temperature many degrees lower than that of the under surface. I submitted an enquiry on this point to an eminent authority, Dr. H. T. Barnes, Professor of Physics at McGill University, who was so good as to furnish me the information which had been embodied in a paper called *The Expansive Force of Ice*, by Messrs. J. H. Hayward, Norman McLeod and H. T. Barnes, which was read before the Royal Society of Canada in 1914. An ice sheet is constantly working with unequal expansion on the upper and under side since the under

side in contact with the water has always a temperature of 32°F. This causes the ice to buckle upward or downward with consequent upper or under cracks which are likely to fill up and freeze, thus preventing restoration. This causes a continual creep during the changes of temperature in the winter with noise of rupture. Toward spring with rising temperatures, the ice permanently expands very considerably and it is then that heavy pressure against the shores develops.

With a progressive rise in temperature ridges usually become more conspicuous, but the information available indicates that they form early in the winter and before the ice attains a thickness exceeding fifteen inches. This conclusion was reached from observations made by Mr. Sawyer in Maine a number of years ago. Mr. Dan. McLachlin of Arnprior informs me that a ridge has been seen to form suddenly on the Lac des Chats during mild weather following low temperatures in the early part of the winter. An unknown observer writing to a contemporary newspaper stated that in the early part of the winter of 1854-5 a movement of the ice on Lake Dore, Renfrew County, occurred which created an arch under which a man could stand and piled up along the shore a wall of stones and other material which had in places a height of twelve feet. The ice ridges grow vertically as the expanding ice compresses their bases. Meanwhile the condition of the shores is changing. They become bare, rock and sand absorb the sun's heat and water of relatively high temperature seeps under the edge of the ice, loosening its rigid grip. The thawing sand and gravel beneath can now serve as a sort of lubricant, should a landward thrust of the ice develop. The occurrence and extent of this development are influenced by a variety of factors; thickness of the ice, presence or absence of snow on it; weather conditions—for example, sustained high temperature as contrasted with a diurnal swing above and below freezing point; changes in water levels now rising with the spring flood, the extent and condition of ice resting on or adhering to the ground. On fortuitous combinations of these factors, the results may be supposed to depend. It may be that the combinations productive of extreme pressure occur only at intervals of many years. This idea is confirmed by the remarkable series of walls at Lake Dore, and it is important to those interested in a practical way as unusual weather conditions may produce heavy pressure where there is no previous evidence or history of such and this danger is likely to be induced when currents are reduced and levels stabilized through the construction of dams.

CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF NORTH-EASTERN LABRADOR

By BERNARD HANTSZCH

"Beitrag zue Kenntnis der Vogelwelt des nordöstlichsten Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechsfundfzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II. Besonderer Teil (Detailed Part), pages 307-392.

(Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.)

(NOTE.—The illustrations in the January instalment should have borne the following legends: "A Greenland Iceberg," p. 2; "Port Burwell, East entrance to Hudson Strait, in 1904," p. 7. From "The Cruise of the *Neptune*," by A. P. Low, Ottawa, 1906.

The old Moravian mission station shown in the picture has been used during 1927-28 for quarters of the Royal Canadian Air Force patrol conducting a survey of ice conditions in Hudson Strait for the Department of Marine and Fisheries, in connection with similar stations at Wakeham Bay and Nottingham Island. The Royal Canadian Mounted Police have maintained a post at Port Burwell since 1920, near the old mission station. At the R.C.A.F. post are now two radio stations. The first, close to the mission house, is a short wave station with personnel of the Canadian Corps of Signals. About one hundred yards from the house and on a small hill, are the two masts of the powerful long-distance station of the Department of Marine and Fisheries. The crew of the C.G.M.M. S.S. *Canadian Raider* are also wintering here, 1927-28. The difficulties of navigation by water on this foggy and rock-bound coast experienced by Hantzsch and portrayed in this article, were recently paralleled in the air by Flying Officer A. A. Lewis and Flight Sergeant N. C. Terry, who, with an Eskimo guide, were forced down on moving Atlantic ice 60 miles from shore east of Port Burwell, while supposed to be over Ungava Bay.—R.M.A.)

FROM an ornithological point of view the richest locality in these inhospitable regions is the sea, which is capable of affording food to a greater number of individuals than the cold, bleak land. It is also excellently suited to the purposes of the ornithologist in that the local conditions make it possible to travel a great deal by boat along the coast, where the opportunity is continuously afforded him to observe and to collect. At least this is so in theory even if the practice not seldom shows conditions less favourable. One of the chief considerations on such excursions is the use of as small a boat as possible, which in case of necessity can be handled by one person on the water, with which one can travel over shallow

places of the sea and approach close to the shore, and which is light enough to be pulled up on the beach by a few people. (p. 189). If one joins wandering Eskimos—of whom usually only the women and children travel in a boat, the men travelling nearby in kayaks—then one is not very free in his movements and for the sake of the welfare of all, will seldom be able to go after the birds. Hiring people for larger excursions causes difficulty, since the country is everywhere so sparsely inhabited, and then also a clever man likes neither the constraint of any kind of command, nor does he find pleasure in leaving his family, in order to join a stranger, who besides can hardly make himself understood. If one takes along several people he may feel better off but he needs a larger, more expensive boat; also a tent and food supplies to accommodate the greater number of persons. Because a clever Eskimo under favourable conditions not only can get food and skins in abundance, but also at the trading stations by trade of his superfluous pelts can fit himself out well with European necessities of life, one has to pay him high enough for an engagement. My chief companion received one dollar a day; on excursions we took preserved foods in abundance and were concerned only incidentally in hunting and fishing for our food. Even when I was staying at the mission station, I had to count on at least 10 marks (\$2.38) a day for the current living expenses. I add this because it is thought that life in those districts costs next to nothing. It was said to me by a merchant, that he thought good business could be done on a collecting trip in Labrador. I consider this impossible for one not native to the country.

If one takes only one man along on these excursions, as I usually did, it facilitates travel in many respects, but it is necessary to take hold vigorously with the propulsion of the boat and other work on land. In this way, one loses time and opportunity for observation and collection of the birds. Progress in those waters often offers great difficulties, and it is often of pressing necessity to direct one's whole attention to the safety of the boat, giving up all else—in order not to risk one's life.

The sea is rarely calm for any length of time and then only along sheltered coasts or in inlets and at indefinite periods. In many places of

those parts of the sea visited by me, especially about capes and in straits, strong currents are regularly found, which can be overcome only by natives who know the places, (p. 190) and who take every advantage in the most prudent way. Often the water whirls and boils as in a cooking-pot, and occasionally the little boat is seized in an eddy and in spite of the most violent rowing turned about irresistibly in a circle, so that it is lost with all on board, if it shoves against cliffs or ice-cakes.

In the McLelan Strait (Ikerasak), which joins Ungava Bay to the Atlantic Ocean, I saw ice-cakes drive along in the current as rapidly as railway trains. Then it is a case of waiting patiently, often for days at a time, until the experienced guide recognizes the moment of the greatest possible quiet, which is dependent on the falling and rising of the tides as well as the wind. Now one dashes out and has to let any interesting piece of work go by the board, in order to take advantage of the favour of the sea. Without comment I adapted myself in this respect to my experienced comrade; bravely we fought together against the mighty powers of the sea, and were then happy, sang, and laughed, when we sat by a smoking wood fire in a secure harbour and cooked fish and tea, or, tired out, lay down side by side in the little tent.

Certain districts cannot be reached at all on account of the current; for example, the Button Islands, north of Killinek, which I should have liked to visit. Only when the sea is entirely clear of ice and a calm prevails, do the natives dare to journey across Gray Strait. My companion had been there in a kayak on a hunt for polar bears with two other men. The people turned back across Gray Strait without success in hunting, in spite of the fact that they had seen three old bears, as soon as unfavourable weather signs set in. Strange Eskimos, who do not know the water, never dare to cross.

In all these coastal districts, especially down the whole of Ungava Bay, are numerous cliffs and rocky islands. Since the difference between the ebb and flow of the tide, as remarked already, is about ten metres in those waters, the reefs so dangerous to navigation at times rise high above the water, while at other times the waves breaking against them can scarcely serve as signals of warning. Many rocks are at high tide not dangerous at all, while they become deadly at low tide. Naturally the draught of the ship plays an important role. Large craft do not come near the land at all on the east coast of Ungava, on which account the whole district has been charted very inaccurately up to the present time.

The reefs become especially dangerous in union with the currents, and even many an Eskimo, acquainted with the sea from childhood, has come to his death through an unlucky crash against the rocks. (p. 191.)

In stormy weather travel on the sea is quite unsafe. With a good stout boat and several people for service, one may perhaps dare to sail near the coast in a strong wind, but there is often great difficulty and even danger to life in going ashore. The coast is rocky almost everywhere also in places—for example, on the whole north-east side of the district as in the farther environs of Cape Chidley—falling sheer into the sea. In an unfavourable wind, a sheltered place for the boat is scarcely to be found here for great distances. But in less dangerous places one must also be careful to go in the lee of the land, especially at at high tide, if he does not wish to risk an uncertain and probably insecure anchorage of the boat. Many a time, even in the most favourable parts of Ungava Bay, we had searched in vain for hours to find a suitable place where the boat could stay well sheltered and where there were driftwood and fresh water. If one is forced, however, to go ashore at ebb tide on these coastal regions which change so with the tide, then one has to draw up the boat, either by means of rollers over the stones and rocks, or gradually bring it up higher with the rising tide, all of which is difficult work at night and the boat may be shattered on the rocks in the operation. My Eskimo companion, Paksau, solved all these difficulties with the greatest calm, foresight, and cleverness, so that serious misfortune never overtook us. I describe these details, in order to give a picture of these regions to one who does not know them, and at the same time to show how much time and strength is lost from the real chief occupation of the explorer through difficulties of this kind.

Level beaches are rare, being more frequent in the inner part of bays farther in the south of the east coast of Ungava Bay than on the Killinek islands; real sandy beach exceptional. I found rather large stretches of it south of Takpangajok Bay; they were, as may be supposed, rather frequently visited by sandpipers. For the most part, the shores are covered with rocks and broken blocks of stone, frequently covered by different kinds of sea-weed. These make walking still more difficult. If one did not wear the thin-soled, and therefore flexible Eskimo boots, he would slip continually. Whenever one walks at night-time over these sea-weeds, between which some sandy slime often collects, a shining and glittering is observed underfoot. The wonderful phosphorescence of the sea, which, in night rowing, sprays

about the boat in a thousand sparks, is seen also on the beach at ebb-tide, a proof that countless phosphorescent crustaceans remain behind, perhaps to be found and devoured more easily by the birds because of their striking illumination (p. 192).

In weather not absolutely settled, it is advisable on boat trips not to depart too far from the coast. The Eskimos are very cautious in this respect and would rather make a wide curve than betake themselves far from land in a straight course. Very frequently a thick fog will settle down in a few minutes, and confuses even the natives who know the place, and if to complete it, an unfavourable wind comes up in these dangerous waters, disaster can easily follow. When I carried out different excursions, in order to examine old Eskimo graves and take important objects out of them, my heathen companions, men and women, fell into superstitious terror whenever fog occurred, apparently considering it something ghostly. On one occasion night completely surprised us, because on the way home I had pursued a pair of eider ducks, and since the air was foggy, there was almost nothing of the coast to be seen. When at last the lighted tents could be seen through the night-haze and we came safe and sound on the land, the cries of joy of the anxious people seemed to have no end. Whenever the fog stayed for a considerable time, many water birds which otherwise live on the open sea usually approached the coast. Yes, they come in flocks clear into the bays, something which is greeted by the natives with joy. The men then start out on a bird hunt and often take rich booty in suddenly surprising them, since the birds, especially Murres, Guillemots, Fulmars, Gulls, and Jaegers are much less shy than otherwise. Sometimes in a thick fog in September near the mission station of Killinek I have seen flocks of hundreds and even thousands of these birds together, especially of *Uria lomvia* [Brünnich Murre, which, indeed, because caught on the fall migration, restlessly pass hither and thither. When the weather clears up, the birds vanish in the shortest time; they separate, journeying gradually southward, out upon the wide ocean, which offers to them greater safety and richer nourishment, and does not freeze.

The most interesting phenomenon of the northern sea, its greatest beauty and at the same time its greatest danger, is the ice—ice in its manifold forms and sizes from the little rocking cake up to the gigantic, fantastically formed berg; with its misty white, green, or blue colour tones, at times even soiled with earth. With all its cold splendour and rigid greatness, it is ani-

mated by the mysterious changing play of the tides and the powerful strength of the wind. With its advent the gloomy sea changes into a fantastic fairy-land—streaming with enchantment when the morning sun smilingly draws across it, or lighting up in ghostly fashion when the pale, wonderful veil of the Northern Lights draws across the sky. (p. 193.) The sight makes only half its impression on him who sees it continually, or upon one who observes it from a great ship in company with many others. The recollections of it made the deepest impression on me when I was working my way through the ice of Ungava Bay alone with my Eskimo man, and one night I was frightened in my sleep by the crackling burst of thawing icebergs. At the same time there were also many birds in the ice, even if it was for the most part dangerous or even impossible to bring them down.

In the wind and current we could not of course go between the driving cakes of ice, and when calm weather prevailed, we made only slow progress with a tiresome winding here and there of the boat. And the waterfowl know how to hide in the ice so well: the gulls and sandpipers usually fly away, though, from their resting places, when one has with difficulty worked his way within shooting distance. Shots at flying birds were therefore most frequently taken, and it was not always possible to retrieve from between the ice cakes the game we were lucky enough to bring down.

Even if in the districts I am describing the ice does not cover the sea the whole year through, yet the sea is wholly free from it only a few months or even weeks. The variation between the different years seems to be rather significant, though detailed information is not extant, since the district is very little visited. In general, northeast Ungava Bay should be best suited for ship's travel from the middle of August to the end of September, since later in the year storms, fog, and blizzards bring danger. In 1906 Killinek Bay was not entirely free of ice until September 22. As a rule, at this time the new season's snow is lying on the land (in 1905), one-half metre deep after September 15), and in November the sea begins to freeze over again on the coast.

In the year 1906, after the unfavourable summer, we had an unusually long and warm autumn, so that though snow fell from the beginning of September, it always disappeared again up to October in the lower-lying places. Also the young ice forming on the sea did not yet have strength to withstand the movements of the water caused by wind and tides.

Since I stayed only from the end of July to the middle of October in those districts, I wish to give no detailed description of the bird life at the change of the seasons; my observations might easily lead to wrong conclusions. However, so far as the information of the missionaries stationed at Killinek and the natives is concerned, the following may perhaps have some weight.

Early in the spring, often in March or April, the first migratory birds come back, especially the Snow Buntings. (p. 194.) The rest gradually come in up to the end of May, but the dates of arrival seem to vary. Different kinds of birds are said to arrive in the locality almost entirely on the spring migration, others occur only on the fall migration.

June, even in unfavourable years, is the chief breeding month. If unusual disturbances occur in the weather, certain birds might entirely abstain from the business of breeding, rather than postpone it to a considerably later time. As a rule the sun at this season possesses enough strength to create the conditions necessary for breeding. Indeed, during the time following the rearing season of the young, in July and August, one sees so many grown individuals of water birds in places where they could scarcely have been breeding, that it is hard to believe that these are not younger creatures not yet capable of breeding. Perhaps it is that maturity does not occur with the northern birds until a greater age than we usually assume or than the faded plumage of many species—for example, certain Sandpipers *Tringa canutus* [Knot], *Crymophilus fulicarius* [Red Phalarope], Ducks (e.g., *Somateria*), etc.—leads us to suspect? Although these questions have been discussed often enough since the time of Faber (*Hochnordische Vögel*, 1826), they are still not sufficiently cleared up for most species.

The southward flight of the plovers and the snipe-like species of birds, whose young are already capable of flight, recommences as early as August. I observed the confiding *Actodromas fuscicollis* (White-rumped Sandpiper) frequently, the first on the 16th of August, the last as late as November 2nd on the Labrador coast near Hoffenthal. In general, however, the flight of the sea-birds in the fall of 1906, was unsteady and varied with the weather, whereas the land birds, in the Killinek district, showed very characteristic phenomena of migration.

At the end of August the indigenous Snow Buntings (*Passerina*) became restless, came in family groups to the places where seeds were abundant, and enlivened the region far more than before. At the beginning of September they

disappeared. On August 27th I observed the first Longspurs (*Calcarius*); from the 29th on, the species became common and remained the most abundant up to the middle of September. The Snow Buntings appeared at this time only in small flights, which to all appearances seemed to be of northern migrants. But the Lapland Longspurs also decreased in number and in their place, from the middle of September, Redpolls (*Leinfinken*, *Acanthis linaria rostrata*) arrived, the first of which I collected on the 10th of the month. They passed through the neighbourhood for perhaps fourteen days, during which time along with *Calcarius*, they were the only ones observed. When, at the beginning of October heavier snowfalls set in, migrating Ptarmigan (*Lagopus rupestris*) appeared, of which I collected the first on the 4th of October. (p. 195.) Flocks of these were observed daily up to my departure on the 11th of this month. At the same time, as already a few days before, Snow Buntings came again, and really in large companies; the first migrants were shy and restless, the later ones, however, perhaps tired and hungry, were tame everywhere.

At last, however, all these land birds vanished sooner or later, according to the weather, and then only solitary Ravens (Raben) and Snowy Owls (Schnee-eulen) frequented the neighbourhood, especially near human dwellings; usually during the winter they try to hold out in the same place.

As long as the sea is open, it is still visited by Gulls, Guillemots, Murres, Dovekies (Krabben-tauchern), etc. Among the Sea Gulls, the dainty Ivory Gulls now also approach the land, and come confidently, desiring the offal of the seals, which at this time are often daily caught by dozens in nets and are eviscerated on the beach. But when winter's cold finally puts sea and land in chains, these birds then betake themselves to the edge of the ice or out to the open ocean, or they seek the few places near the coast where the strong current prevents freezing. Then it is dead on the wide ice- and snow-surfaces; only the restless Polar Bear lurks near the breathing-holes of the seals and the hungry fox follows his trail. Human beings, however, eat of their stored food supplies, and sleep or amuse themselves in various ways in their snow-huts until the new spring brings to their rude homeland new bird song.

The importance of the bird-world is still quite significant to the Eskimos of those districts even now-a-days, after whites settled down among them and the possibility of actual starvation is withdrawn. For people whose only self-obtained

food is gained by hunting and fishing, the produce of the bird-world is of moderate value to be sure, but still very worthy of attention.

Any difference between useful and harmful birds, such as is customary to set up in our regions, the Eskimo naturally knows not at all. By him, those species are the best-liked, which are not too hard to kill and which afford the largest and best-tasting portions for the cooking-pot. He does not think of anything much farther, true to his light-hearted temperament, nor does he spare the creatures in any way at all, but shoots whatever comes in the way of his gun that seems to him worth shooting. In this respect, unfortunately, Christian culture in the other districts of Labrador has done little. It is no wonder if after the general importation of firearms, as well as the increase in the needs of the people—which even in those outlying districts have grown, in consequence of permanent settlement of the whites—quite a noticeable diminution of the (p. 196) bird-world is perceived in places, as is stated by the older people. By that it is not to be said that the number of individuals in general has really declined: it is that the birds go to localities where they are exposed to no pursuit or at least to only casual and unnatural persecutions, and with instinctive wisdom avoid those districts where they experience a more frequent molestation with firearms. The small birds are hunted only rarely, most often when during the season of migration they fly or sit in closely packed flocks. The larger birds, on the contrary, especially Eider Ducks, Murres, Guillemots, Gulls, and Ptarmigan, are pursued vigorously by water and on land. Of certain species, especially the ptarmigan, the Eskimos enjoy the raw, possibly still warm, entrails; of others these are eaten only in times of poor hunting. The waterfowl which are killed are usually skinned; then they cut off head and feet and boil the body for a short time in seawater. Birds which they wish to keep for some time in the colder seasons of the year, they put away mostly with the feathers on, in a place protected from the dogs; in the warm seasons, however, they prepare them as for cooking and let them dry in the air.

The feathers of the birds are little used. Formerly, as even now in Greenland, by plucking off the covering feathers from the skins of the eider ducks, they made a downy pelt which they used for exceedingly soft and warm undergarments. Occasionally a collection of the ordinary feathers is made for the whites, since the Eskimos of the district seen by me possess no beds even. Upon request from the trading station at Killinek, however, they seek the

breeding places of the eiders for down and then apparently act there in such a way that it must be feared the birds will sooner or later desert the neighbourhood or at least diminish in numbers. In respect to this treatment of the animal kingdom, however, the mission ought to be concerning itself through instruction, to preserve the natural wealth of the country, in place of helping to undermine it through thoughtless purchase of products obtained in this way. Other Northern districts, for example, Iceland, act far more wisely in this respect, though there is still much to be desired in the way of reforms.

If the natives find eggs in searching of the bird-breeding colonies or in any other sort of place, these are naturally taken along without further thought and eaten with especial pleasure as a welcome change from the usual fare. At the present time, however, the neighbourhood possesses only one really good breeding place, to which, as already remarked, many Eider Ducks repair for breeding. (p. 197). These are several small islands not easily accessible, in the extreme northeast of the district observed by me on the Labrador coast.

The Eskimo, however, is not entirely a matter-of-fact pursuer of the bird-world, thinking only of the acquisition of food. He takes pleasure, too, in the living creatures and observes them attentively, without having always the intention of hunting them. Whenever he sets out after more valuable booty, seals or reindeer, he avoids as much as possible any other shot in order not to scare the game. He tries besides to guess at the weather from the flight of the birds, to guess at the presence of certain fishes from the occurrence of certain bird species depending on these; he observes the connection between the seasons of the year and the flight of the birds, and rejoices in the song of the Snow Buntings and Horned Larks announcing the spring.

And this bird-world, coming and going annually, winging its way into endless distances and suddenly appearing again, possesses for him, the child of nature, something remarkable and mysterious. He surrounds it with the poetic fancy of pagan superstition, which is of great psychological interest to us sober, matter-of-fact people.

When sorcery still flourished among the Eskimos, certain parts of the bird's body, especially feathers and bones, played important roles. They were also used as amulets in order to invest the bearer with certain characteristics of the species of bird from which they came, or to procure for him great luck in hunting. The living bird was occasionally looked upon as a bearer of death and destruction, if the *Torngset* (spirits) or the

magicians and witches made use of them in order to harm others. Just a few months before my arrival in Killinek someone was reported as having seen one of those mysterious blood-red gulls, which can be created by sorceresses from their delayed menstrual blood. Whenever such a bird is sent, sickness and death follow, and not long after this reported appearance three men in the prime of life had died one after another in the one house. In different legends, which were told to me by an old heathen woman, birds play a weighty role. One time it is the wing bone of a Snowy Owl, which a young maiden who desired to marry takes for a husband, and which after touching her body changes itself into a great Snowy Owl. She is carried by the bird up to its high, rocky nest, where she almost perishes in longing for human beings. The Snowy Owl husband brings her for food an abundance of birds and she secretly weaves a rope from their sinews. At last, when he brought to her a young caribou, the rope is long enough to let her down. On the same day the relatives (p. 198) of the maiden appear below the rock, just when the bird is away. She climbs down the rope and goes into the tent of her people. Soon the owl husband returns and searches for his vanished wife. He flies over the tent, is killed with an arrow by one of the men and falls to earth changed into a wing bone. Or it is the large Loon (*Urinator imber*), which commands a youth blinded by the sorcery of his wicked stepmother, to wash himself in the water of the pond upon which he himself is swimming, whereupon the blindness is removed. Now the bird allows himself to be seized by the healed one and carried home, where he grows to giant size, falls upon the wicked stepmother with a terrible cry and drives her into the sea. The Raven, just as with other people, is recognized by the Eskimos as a wise bird and now and then appears in a way quite similar to our legends. That he is considered vain, I learned from a little fable which I wish to tell in conclusion. The *Tullik* (Loon) and the *Tulluguk* (Raven) were coloured by each other in the old time. The wise Raven painted the Loon first; lower parts white, above, however, black with white spots. Then the Loon did the same for the Raven until all the colours were used up. But the Raven was vain and exclaimed: "I don't want to look just like you!" Then the Loon flew to the earth house of the Innuits (people), who had just gone away, and stole the stone train-oil lamp. With the dirty seal-oil he painted the Raven, and since that time all ravens look black.

On October 11th I took leave of my quiet

mountains and valleys, which were now gradually putting on a wintry appearance, parting also from the kindly persons who had aided me in my work and in other respects had tried to make my stay in their midst as pleasant as possible. I went on board of the *Harmony*, which had returned unhindered to Killinek in spite of the late season of the year. About three o'clock we weighed anchor and steamed with dusky cloud effect toward Gray Strait. In unusual evening clearness the Button Islands, and somewhat later the geographically uncertain Cape Chidley, lay before us. We entered the Atlantic Ocean, journeying down the Labrador coast in order to stop at all the six stations of the Moravian Brethren; namely, Rama, Hebron, Okak, Nain, Hoffenthal, and Maggoviik. We stopped from three to nine days at the different places, so that I had time to roam over the region hurriedly at least. But the avifauna, with the exception of the migrating Snow Buntings on the land and the Dovekies (*Alle*) on the sea, was extremely scarce, in this advanced season of the year. Excursions hours in length (p. 199) brought not a single bird, indeed not a single creature at all before my eyes.

Thick bush of birches and willows, as high as a man, is already found at Rama. In the inner part of the bays south from Hebron a low coniferous growth begins, which at Okak truly reminds one of our forests. The trees are indeed shorter and more compressed in their form, now and then standing out loosely and openly with one another, in other places so dense, grown up with underbrush and broken branches, that crossing is tiresome and tedious. But these forests appear only as oases, indeed more numerous toward the interior than in the vicinity of the coast, where the population for centuries has worked at their destruction. New growth is to be observed only in a slight degree, owing to the exceedingly slow growth of the trees. As for the rest, the landscape shows little difference from the north. However, level earth plains appear to greater extent. Such have here and there also a rather vigorous plant growth. These districts are poorer in ponds and lakes than the northeastern Ungava Bay coast; streams, however, are rather abundant, though usually of only small size. In the second part of the present work I shall consider these peculiar Labrador coasts by allusion only.

On November 16th I arrived at St. Johns, the capital of Newfoundland, and left the *Harmony* and its crew with gratitude, especially to the kindly captain J. E. Jackson, who had continually aided me; at once made a connection, fortunately, with the steamer *Siberian* of the Allan

Line to Glasgow, where I landed in good health on November 26th. On this journey across the ocean as far as observation took place in the frequent bad weather, only Kittiwakes (*Rissa*) and Fulmars (*Fulmarus*) were seen in numbers as our companions, to which company other species did not join themselves until near Ireland and Scotland. One of the few fellow passengers on this late journey was Mr. J. G. Millais, of Horsham in Sussex, known ornithologically especially on account of his duck studies and excellent collection of duck skins, and with whom I entered into most friendly relations in this way.

At home again, I am extremely conscious of the fact that because of the shortness of the time at my disposal I have in no way completely investigated the ornithology of the north-east coast of Labrador and Ungava Bay. Notwithstanding this, the following presentation of the different species of birds may serve not only as a new contribution to the ornithological data of those regions, but to the Arctic avifauna as well.

In the treatment of the different species I shall be as brief as possible, so far as it is not a case of particularly striking or characteristic representatives of the avifauna.

In the nomenclature I confine myself to the present state of the science, though I am, however, fully aware that numerous names, especially in regard to their subspecific status, are still very much in need of revision and improvement. The establishment of the question whether the representatives of a species differ in the various geographical districts, and to what degree, must also be pointed out as a main problem for the study of Arctic birds at the present time. The accounts in the literature are in this respect often uncertain, contradictory, and in many cases obviously incorrect. The lack of special research material forces me, however, in certain cases to adhere to them, even if reluctantly.

I also set down the names used by the Eskimos of the district for the different bird species as far as such names exist or at least came to my knowledge. In respect to the orthography of the same, I follow in general the rules employed by the missionaries of Labrador. Still I should like to point out, that the pronunciation of the natives in no way corresponds entirely to the written forms of our German language. *I* and *e*, *u* and *o* are often not distinguished by them, *k* and *g*, *p* and *b*, *t* and *d* just as little. I have refrained from a distinction of the deep guttural sound *X*, which often reminds one of *r* or guttural *ch*, from our *k*, since such a sound in numerous cases could have occurred only arbitrarily. *R*

also, and still more *rr*, is a guttural sound and reminds one of the German *ch* after *a*. *G* between two *i*-sounds is spoken softly, almost like *j*, otherwise however, between *a* and *u*, roughly just like the German *ch*; *gg* sounds a little clearer, more like the German *ch* after *e*. *V* takes a middle position between *w* and *p*. The pronunciation of *ts*, *ds*, *tj*, *dj*, written many times merely as *j* or *s*, is difficult and changeable, reminding one as a rule of a closed *dsch*. Still less does the pronunciation of *l*, *ll*, *dl*, *tl*, *gl*, resemble a German sound; it is a very different kind of a soft and closed *dl* with broad tongue. *Ng* must be spoken as one sound, just as *ai* must be. Many times, however, it is, as I have said, scarcely possible to repeat adequately with our letters a word that is heard. In the determination and explanation of bird names, the missionaries, Mr. Perrett and Mr. Waldman, were helpful to me; furthermore I followed the date of the Labrador-Eskimo dictionaries by Friedrich Erdmann (Labrador-Eskimo Wörterbücher, Part I, 1864; Part II, 1866, published in Bautzen), as well as the lists given by the missionary S. Weiz in the appendix to Neumeyer's work on the International Polar Expedition, 1882-83, Volume I, Berlin, 1891, pp. 99-101 (Internationale Polarforschung 1882-83, Band I), and lastly (p. 201) Theodor Bourquin's excellent Grammar of the Eskimo language on the Labrador Coast, published in 1891 (Grammatik der Eskimo-Sprache an der Labradorküste). The author of this painstaking work—the Reverend Pastor Bourquin in Herrnhut in Saxony, had the great kindness to look through my article and to correct it, so that I can hope even in this respect to avoid any great errors.

I shall in every single case indicate the literature used by me in the treatment of the different bird species. But in order to avoid unnecessary repetitions in the citations, I put down here the works which I must mention often, and therefore cite only in an abbreviated form.

LUDWIG KUMLIEN, Contributions to the Natural History of Arctic America, United States National Museum, Bulletin No. 35, Washington, 1879.

LUCIEN M. TURNER, List of the Birds of Labrador, etc., *Proceedings of the United States National Museum*, Vol. VIII, 1885, pp. 233-254, Washington, 1886.

H. B. BIGELOW, Birds of the Northeastern Coast of Labrador, *Auk*, Vol. XIX, pp. 24-31, Cambridge, Mass., 1902.

JOHN MACCOUN, Catalogue of Canadian Birds, Geological Survey of Canada, Ottawa. Part I, 1900; Part II, 1903; Part III, 1904.

C. W. G. EIFRIG, Ornithological Results of the Canadian *Neptune* Expedition to Hudson Bay and Northward, 1903-06, *Auk*, XXII, pp. 233-241, Cambridge, Mass., 1905.

A. P. LOW, Report on the Dominion Government Expedition to Hudson Bay and the Arctic Islands on board the D.G.S. *Neptune*, 1903-04, Appendix II, pp. 314-319, Ottawa, 1906.

FRANK M. CHAPMAN, Handbook of Birds of Eastern North America, 7th Edition, New York, 1906.

CHARLES W. TOWNSEND and GLOVER M. ALLEN, Birds of Labrador, *Proceedings of the Boston Society of Natural History*, Vol. 33, No. 7, pp. 277-428, Boston, 1907.

For numerous personal notes, I thank the missionary, Mr. W. Perrett, who for years has been actively interested in the avifauna of Labrador, and has collected eggs and skins.

In the present work I do not enter upon the incomplete material in birds' eggs, which I received during my expedition in Labrador, and even in earlier years, of species there, since most of the specimens do not come from the districts under my special observations.

I leave out a numeration of the species cited by me, since the occurrence of several of them

is not verified by authentic material. The number of the bird species given for our district is about one hundred; not much more than forty, at the most fifty, might, however, breed in that place or at least in the immediate neighbourhood to the north and south. With certain species, the knowledge of the specific differences, not to mention the subspecific differences, is not at all indisputably settled as yet (p. 202). May the present work, which outside of the short communication of G. H. von Schubert's "Correspondence Notes from Labrador" (Correspondenz Nachrichten aus Labrador, *Gelehrte Anzeigen der Bayerischen Akademie der Wissenschaften*, Bd. 18, München, 1844) represents the first work in the German language in this respect, add a little to the elucidation (Klärung) of ornithological conditions in Labrador.

[Conclusion of Part I. Part II—"Detailed Part"—will commence in the April issue.]

OTTAWA FIELD-NATURALISTS' CLUB—REPORT OF COUNCIL, 1927



SIX MEETINGS of Council were held during the past year, and a good deal of quite steady work has been done by the Committees and Members of Council. At the first meeting the committees and editors of *The Canadian Field-Naturalist* were appointed. Mr. C. L. Patch, Chairman of the Committee of this Club appointed to co-operate with a Committee of the American Ornithologists' Union in making arrangements for the Ottawa meeting of the latter society in October, 1926, reported that \$375.33 had been raised by subscription; \$375.64 was expended; and that \$132.50 of the \$150.00 contributed by the American Ornithologists' Union towards the expenses of the Ottawa meeting had been returned. To finance such a meeting so successfully was no small task, and this Committee deserves great credit for their excellent work.

An important asset of the Ottawa Field-Naturalists' Club is the few sets of back numbers of its publications still in stock. The following price schedule was fixed by Council for the few remaining sets; Transactions from 1879 to 1886 at \$3.00 each; single numbers of a volume from 1886 to current volume 30 cents each; and numbers of current volume 25 cents each. Some of the back numbers are now very scarce and reprints of such numbers will soon have to be made.

During the past year Council revived one of the old time social functions of the Ottawa Field-Naturalists' Club, and held an Old Time Soirée at the Victoria Memorial Museum on April 29, 1927. This Soirée was a marked success, over 100 persons being present including nine past presidents and several charter members of the Club. Dr. H. M. Ami gave an interesting address on Old-time Soirées and Excursions of the Club. After this address the following special exhibits were visited: an exhibit by Mr. P. A. Taverner of sub-species in birds; an exhibit by Dr. E. M. Kindle showing representative Ottawa fossils and concretions; and an exhibit by Dr. R. M. Anderson of mammals of the Ottawa District. The authors of the exhibits explained the important features illustrated, and the specimens were selected with a view to showing vividly the main ideas.

The question of increased membership of the Ottawa Field-Naturalists' Club is important, and is considered at many of the Council Meetings. Back records show that the membership of the Club in 1913 was 330, that year 4 per cent of the members resigned, but in spite of resignations, the membership increased three per cent. In 1920, or in an interval of seven years the membership of the Club had increased to 600, and between 1917 and 1920 the membership was doubled. The present membership is 570, a

decrease of 5 per cent in the last seven years. The membership committee, headed by Mrs. Wilmot Lloyd, has done excellent work in an effort to secure new members, and this past year some 45 new members were secured.

The work of the Publications Committee and Editor of *The Canadian Field-Naturalist* is greatly handicapped by lack of funds, and anticipated improvements of the official publication of the Club have necessarily had to be dispensed with

for the present, as the estimated cost of publishing and distributing Volume 41 under present conditions is \$1,260.00 and the revenue only \$1,090.00. Although the volume is not as well illustrated nor as attractive in make-up as Council had desired, nevertheless we feel that valuable scientific material has been published, and hope that members and authors of papers will continue their generous support of *The Canadian Field-Naturalist*.—J. F. WRIGHT, *Secretary*.

STATEMENT OF THE FINANCIAL STANDING OF THE OTTAWA FIELD-NATURALISTS' CLUB AT THE CLOSE OF THE YEAR 1926-27

ASSETS.		LIABILITIES	
Cash in Bank.....	\$96.82	Graphic Publishers Limited.....	\$616.34
Unpaid membership dues, 1927.....	129.50	Editor.....	50.00
Bills receivable.....	488.43	Deficit.....	48.41
	<u>\$714.75</u>		<u>\$714.75</u>
RECEIPTS		DISBURSEMENTS	
By Balance in Bank.....	\$22.54	Graphic Publishers Limited.....	\$1325.00
Membership Dues:—		Exchange.....	25.50
Current.....	965.16	Sundries.....	14.40
Arrears.....	35.50	Editor.....	50.00
Advances.....	57.25	Purchase of back numbers.....	46.00
Affiliated Societies.....	67.50	Charter fees to Provincial Government of Ontario.....	17.00
Advertisements.....	49.00		
Back numbers and Separates.....	216.26		
Reprints and Illustrations.....	116.51		
Donations.....	6.20		
Conversazione.....	11.30		
Interest on Bond.....	27.50		
	<u>\$1574.72</u>	Balance in Bank.....	96.82
			<u>\$1574.72</u>
Audited and found correct:		BERTRAM A. FAUVEL,	
HARRISON F. LEWIS		<i>Honorary Treasurer.</i>	
<i>Auditor.</i>			

STATEMENT RESERVE FUND COMMITTEE

RECEIPTS		DISBURSEMENTS	
Cash on hand, January 1, 1927.....	\$283.06	Interest Payment to General Fund, 1926-27.....	\$27.50
Received from R. B. Whyte Estate.....	100.00		
Interest from Bank.....	6.68	Cash Balance.....	389.74
Interest on Bond.....	27.50		
	<u>\$417.24</u>	TOTAL.....	<u>\$417.24</u>
TOTAL.....			
ASSETS			
Bank Balance.....	\$389.74		
Victory Bond 1934.....	520.00		
	<u>\$909.74</u>		
Audited and Found Correct:		W. T. MACOUN,	
HARRISON F. LEWIS,		<i>Chairman</i>	
<i>Auditor.</i>			

THE QUEEN SNAKE (*Natrix Septemvittata*) IN ONTARIO

By W. J. LeRAY

Department of Biology, University of Toronto



PUBLISHED RECORDS referring to this species in Ontario are meagre. Garnier¹ in his "List of Reptiles of Ontario" refer to what is apparently this species under the name of *Regina leberis* as follows: "Reported by several parties, and although I never saw a Canadian specimen, yet it has been identified by Mr. Smith of Ann Arbor as being in Michigan. Reports most probably correct." In the same list he records *Regina rigida* as "Captured by Mr. Buck at Mud Creek, Lake St. Clair." In a newspaper list published in *The Mail and Empire*, Toronto, October 6, 1894, he records *Tropidonotus rigidus* from Mitchell's Bay, Lake St. Clair. This is probably *Natrix septemvittata*. Dr. Garnier's collection is now in the possession of the Department of Biology, University of Toronto. It contains no specimens of *R. rigida*, while there is a specimen determined by Dr. A. G. Ruthven of the Museum of Zoology, University of Michigan, to be *Natrix septemvittata* which came from Mitchell's Bay and is probably the specimen to which Garnier's reference applies. Nash² refers to *Regina rigida* as "very rare, the only available record is from Lake St. Clair," and to *Regina leberis* "occurs in the same locality as the last, but is even more uncommon." This is apparently based upon Garnier's records. Recent examination shows that Dr. Garnier's collection now in the Department of Biology, contains four specimens referable to *N. septemvittata*. These are: Mitchell's Bay, Lake St. Clair, July 11, 1880; Chatham, Ont., July 9, 1882; Thames near London, Ont., 1882; Lake St. Clair, Ont., 1883. There are apparently no other records for Ontario.

A specimen of this little water snake was collected by E. LeRay at Jackman's Creek, Paris, Ont., May 23, 1926. Another was taken by the writer at Lake Scugog near Johnston's Harbor, Bruce Peninsula, Ont., August 2, 1927. These records indicate that this species may be more generally distributed than we have thought, although it does not appear to be at all common

anywhere in the Province. It is an abundant species in Ohio and the eastern portion of Illinois.

This species is considerably more slender than the majority of the water snakes. Its scales are roughly keeled. It is dark brown above, with three narrow, black stripes (often indistinct) on the back; a bright yellow stripe on the lower portion of the side, covering one half of the first and second rows of scales. The abdomen is yellow with two dark brown stripes in the centre. The upper lip plates (labials) and the nose plate (rostral) are yellow.

The Queen Snake is a semi-aquatic species living on the bushes above rivers and streams, ponds and small lakes. It is an agile swimmer and when disturbed will usually plunge into the water, taking refuge beneath aquatic plants, and remaining under the surface for some time. Several specimens which I took at the Rocky River, near Cleveland, Ohio, were hiding under decaying logs near the edge of the river, while secreted under chips of bark and small flat stones nearby were many very young specimens. An individual was observed lying partly covered with ooze at the bottom of a shallow pond and engaged in the act of feeding. Schools of small fish were swimming about and as they passed above, the snake reached up and with a snapping whip-like motion seized the prey. These fish were very small, so that the snake could swallow them with but a slight movement of the jaws. With the food swallowed the snake awaited the return of the school, when the manœuvres were repeated until the reptile was gorged.

As a captive the Queen Snake has never been induced to feed. Even in the presence of the natural living prey it prefers to remain on hunger strike and soon dies of emaciation.

PAPERS CITE

¹ Garnier, J. H., 1881, List of Reptiles of Ontario. Can. Sportsman and Naturalist, Vol. 1, No. 5.

² Nash, C. W., 1908, Check List of the Batrachians and Reptiles of Ontario. Dept. of Education, Toronto.

NOTES ON SILPHIDÆ IN HALIBURTON CO., ONT.

By L. J. MILNE



LAST SUMMER, at Irondale, Haliburton County, Ontario, I had an opportunity to observe at work the two large genera of Scavenger Beetles, namely *Necrophorus*, the Burying Beetles, and *Silpha*, the True Scavengers. Since I knew that whereas the flatter, weaker *Silphæ* prefer to visit the larger animals such as groundhogs and skunks, the stouter, stronger *Necrophori* come only to small animals. I used dead Deermice in experimenting with the Burying Beetles.

Having had a little experience with *Necrophori* before, I tied a tough but light cord to the leg of one of my Deermice, and leaving a couple of feet of slack, fastened it to a tree. Laying the mouse on the leaves, I left it for an hour in the sun. Upon returning, I noticed that the little carcass was visited not only by flies, but by a pair¹ of *Necrophori*, who were busily tugging at it. I sat down that I might better watch them at their work. At first, their main idea was to drag the mouse, for them a very heavy weight, over to a spot which was bare of leaves, about the length of the mouse away. This was no easy task, for, in size, the mouse was about in the same proportion to the beetles as a freight car would be to a man, and a dead weight too, not on wheels. Picture a human strong enough to move a stationary car its own length, and you will see the great strength of the insects.

By dint of much laborious pulling at the body, the pair of black and orange beetles finally covered the three inches of earth with their mouse, and got it onto the soil they wanted. Then came another difficult task, the burying of it, for which action, the animals are called the Sexton Beetles. Out of sight beneath the carcass, male and female worked together, scraping away their tiny tarsi-fulls of earth, making a depression to receive the mouse, which they pulled into the hole as they dug. In less than fifteen minutes, they had the body halfway under ground.

And then they came to a root! But what matters a root? And this was only the diameter of the beetle? The powerful mandibles soon cut it off, the male chewing at one end, the female at the other, and they dragged it out from under the mouse. From then on, all went beautifully. Sand was thrown out quickly, and the body rolled and pulled around until its back was level with the surface. The earth, which had been hauled out, was now piled on top, together with fallen leaves.

Soon the female disappeared below, to lay her eggs on the carcass, now entirely buried. The male continued to pull leaves over to cover the mouse more, but finally got restless, opened his wing-covers, and flew—into a cyanide killing bottle. His mate fared likewise a few minutes later, and the mouse, so nicely interred, came to sight with a rude jerk on the cord.

Moving the carcass, still tied to the tree, over about a foot, I again left it for an hour. When I returned—Alas!—my mouse was gone, and the string hung over a projecting twig, with no animal on the end. The clever beetles had nipped my cord in two, not because they were aware that I would pull up their coming generation's food-supply where the flies could wreak their devastation, but because the string had caught on the twig, hindering their burying actions. I do not know yet where that mouse went. I dug up the sod for three feet around the tree, with no results, and I am sure no fox would take away an animal with an odour such as this had.

There are certain distinct differences in habits between the two genera. So far as I saw, *Necrophori* were not interested in carrion to any extent for their own gastronomic wants, but more for an egg-incubator and subsequent host. The genus *Silpha*, on the other hand, seemed far more occupied with eating. *Necrophori*, coming in pairs to small animals, one pair at a time, want to bury first, lay the eggs and afterwards eat. *Silpha* has no notion of burying, and no strength in their flat bodies to do so. They come in hordes, preferably, as noted above, to large animals. They want to eat first, and when filled, mate, and lay eggs. *Necrophori*, do not enter the carcass; *Silphæ* bore under the skin and throughout the body.

In two days, I collected over a thousand specimens² of one species of genus *Silpha* from a dead skunk. This is one of the largest types of *Silphæ*, and they arrived in such numbers that the rattle of their crawling over one another under the skin was clearly audible five feet away.

For the benefit of systematists who might be interested, I might say that in this locality, *Necrophorus tomentosus* Web., *N. pollinctor* Lec?, were very common, and *Silpha surinamensis* Fab., *S. noveboracensis* Forst., *S. lapponica* Hbst., and *S. americana* Linn., were common with an occasional specimen of *Silpha inæqualis* Fab.

¹ *Necrophorus pollinctor* Lec?

² *Silpha surinamensis* Fab.

NOTES AND OBSERVATIONS

CHICKADEES AT KINGSVILLE.—Of interest to bird lovers is a most unusual visitation at the Kingsville Bird Sanctuary in the fall of 1927. Early one morning in the latter part of October I saw from a distance a flock of small birds in our red cedar grove. The diminutive size of the visitors and the fact of their being in a flock attracted my attention immediately, and my surprise was boundless when on closer inspection I found them to be Chickadees. By actual count there were thirty-eight birds in the flock—a most unusual occurrence and one I had never before observed. Indeed, throughout the two previous winters I had not seen a single Chickadee. Within the sanctuary is a reforested area of about 35 acres containing Scotch and white pine, red cedars, Norway spruce, maple, sumach, and elderberry, and at every few rods among these groves a Chickadee could be seen as well as several Juncos. The little birds seemed quite plentiful in the groves until early December, but around January 1st there were only a dozen or so to be seen feeding at our serve-self feed rocks which are well supplied with broken-up walnuts.

There is little doubt that it was the evergreen grove which attracted the Chickadees at that season of the year. As everyone knows, Essex County is very level and the only other evergreen grove to be found in the county is at Point Pelee fifteen miles distant.

I should like to hear from other members of Canadian Field-Naturalists' Clubs and to know if they noticed any marked increase in the Chickadee population last fall.—MANLY F. MINER.

ON THE BRONZED GRACKLE.—I have often watched the Bronzed Grackle hunting for food at the water's edge of streams and lakes and I have supposed, probably correctly so, that they were searching out almost any particle of food whether it be animal or vegetable. It is well known that they act as scavengers about city parks and lawns, but when a Grackle is seen near water it may have other items on its bill-of-fare.

I have in my back garden a concrete bird bath placed on a slight mound and made to appear like a small natural pool. A few aquatic plants, such as Bulrushes and Marsh Marigolds are transplanted in the pool each spring, and a permanent border of Red Osier Dogwood gives summer shade as well as adding to the illusion of a natural pool. A few creek minnows are also secured and placed in the bath, partly to prevent mosquitoes from maturing there, and partly to

give an additional interest to this small bit of city marsh. One edge of the bowl is sunk about one foot in depth, so that it holds sufficient water to remain reasonably cool in summer, while the broad exposed surface of the water allows it to be constantly aerated.

About two hundred yards from my dwelling a small colony of Bronzed Grackles yearly rear their young in the lofty tops of a cluster of white pines. The parent birds make frequent pilgrimages from the nests to the surrounding lawns and gardens. They seemed particularly partial to my garden and I was frankly pleased since few birds could be enticed to visit my grounds, situated as they are in a new section of the city where there is not sufficient vegetation to make it inviting.

One morning I watched a Grackle alight on the stone in the centre of the bird bath. I saw it spear into the water and secure what I thought was a minnow. It walked to the edge of the bath and layed the object on the grass at the border. Returning to the centre stone, it again speared into the water and secured what I was certain was a minnow. This one was taken and placed beside the first. A third minnow was captured before the bird finally picked up all three and flew away. Being away from home all day, I had no opportunity of observing the bird further, but Mrs. Snyder assured me that it had returned several times to fish that day. Upon examining the bath, I found there was not a single minnow left out of the two dozen or more placed there.

I waited several days before re-stocking the bath with fish, thinking the bird would forget its source of fish food, but after again placing minnows there, they, too, disappeared.

This is the only case I have known where a Grackle was a fisher of live fish. Of course in this case, the minnows were confined and had little chance to escape. It is interesting to consider also that this bird, presuming that only one individual was concerned, laid aside its prey until a full load had been collected, and that it placed the fish conveniently together away from the water.—(As read before the Brodie Club).—L. L. SNYDER, *Royal Ontario Museum of Zoology.*

I have had a similar experience with Grackles and gold fish in the pool in my garden in Ottawa. In this case the pool is some fifteen by twenty feet in size, and was well grown with water lily stems and pads but, in spite of this considerable extent and good cover, the Grackles nesting in the vines of a house backing ours succeeded in

considerably more than decimating the pool. In summers previous to 1926 Grackles were frequent visitors to the pool but did not seem to turn their attentions to fishing. That summer, though I was not at home to see it personally, the family reported that the birds were seen again and again to watch for fish at the margin, snatch up such as came within range, beat them on the concrete margin and carry them away nestward. The young Grackles must have lived high this season for though on other years when emptying the pool in the fall I usually took out some three hundred young gold fish of varying sizes, that fall there were no fish of the year and even the breeding stock was greatly reduced. The past summer being home, as soon as the Grackles began their pernicious activity, I plied a little .22 calibre eliminator with some advantage, and reduced the local Grackle population considerably. The number of victims was surprising—far more than could have nested in the vines at the rear—and it was evident that the Grackles of quite a wide area had learned the fishing habit and were attempting to profit thereby. As a result, I had a fairly good hatch of fish this fall and though I did lose some of them, unfortunately the first hatched and largest, the losses were not serious. Protection often resolves itself into a choice of favourites. If we want flowers, we have to uproot weeds; if we want game we must legislate against poachers. In this case if I wanted fish to keep down mosquitoes, I had to abolish at fish to keep down the mosquitoes, I had to abolish at least some of the Grackles that preyed upon them.—P. A. TAVERNER.

INDIAN HEAD, SASK.,

December 12th, 1927.

MR. B. A. FAUVEL,
Honorary Treasurer,
Ottawa Field-Naturalists' Club,
Ottawa, Canada.

DEAR MR. FAUVEL:—

I have been a subscriber to *The Canadian Field-Naturalist* for nearly a year now and so it is coming near the time when I must renew. I feel that this publication should have the support of every Canadian naturalist as it is the only periodical dealing exclusively with Natural History that we have in Canada as far as I am aware. I always recommend it to all my naturalist friends pointing out that it is our own paper and should have our whole-hearted backing, even if it cannot give us as much for our money as some of the American publications. It never can until it gets the circulation and appreciation that it deserves.

In line with this view I am going to have a lot of my gifts in future take the form of subscriptions to this delightful little magazine. I am enclosing my renewal and four others for a start.

(Signed) R. SHORE.

SCREECH OWLS IN MARTIN HOUSES.—Screech Owls are all right in their place but that place is certainly not a Martin house. During last July and August we received between twenty and thirty letters from people living mostly in New York and New England States, each letter describing how Martins had made their homes in houses erected for them but would leave suddenly and return merely to flutter in the air at the entrance to their former homes. We had observed similar happenings at our own home and found that a Screech Owl had taken possession of the compartment. To each person who had written us it was suggested investigations be made and in every case a Screech Owl was found to be occupying the Martin's former home. How to overcome this situation throughout the country is difficult to determine. The best way appears to be the reduction of the entrance to the Martin house, making the opening large enough for the Martins to enter, but not large enough for the Screech Owl. Whether this is practicable I cannot say, and should greatly like to have the opinions of our readers.—MANLY F. MINER.

WOOD DUCKS INCREASING.—Since the Wood Duck has been accorded complete protection, it has been slowly but steadily increasing and a few definite notes may be of interest. In talking with Dr. Robert Cushman Murphy at the meeting of the American Ornithologists' Union he said that Wood Ducks were the most abundant duck in Carolina, where he had just been on a duck hunt. That is, of course, far away from Ontario, but on a visit to Point Pelee on December 21, I was told by a resident who is a conscientious conservationist, that, on the opening day of shooting, these ducks were the most abundant of all and that very many of them were killed. Unfortunately the perpetrators escaped in every instance, and my informant belonged to one of the few parties that refused to kill them. On my return home (London, Ontario) I found awaiting me a memorandum regarding a Wood Duck, and on December 25 I saw the bird itself, which had doubtless been wounded during the shooting season and had lived on my own lake until it froze over. It was flushed by a man on the 22nd and scuttled over the ice towards the open water, but was brought in by a dog, uninjured. But it is doubtful that it

will recover and probably will never be able to fly. These ducks were regularly seen at my place from August onward.—W. E. SAUNDERS.

HOLBOELL'S GREBE RECORDED.—The published records of the occurrence of this Grebe in Lake Ontario as a spring or fall migrant are confined to the western part, notably about Toronto and Niagara. My first definite record for this species in the eastern part of this lake, or adjacent waters, was secured at Hay Bay, in the County of Lennox and Addington, October, 1927, when one swam gracefully in among my duck decoys. Its large size and conspicuous white throat patch rendered it easily recognizable. Like the Horned Grebe this species has the habit of dabbling at the decoys only that in this case the bird's large size and the long sharp bill appeared to accentuate its hostility towards the wooden effigies. Later on, in October and November, near Kingston, I secured three more records of this Grebe, all being of single birds. The sudden appearance of these Grebes in this part of Lake Ontario, where I never previously had the pleasure of recording them, leads me to think that an extensive migration may have occurred.—EDWIN BEAUPRE.

SHORT-BILLED MARSH WREN IN ALBERTA.—On September 19th, 1927, Mr. Arthur Twomey, of Camrose, Alberta, collected a Short-billed Marsh Wren, *Cistothorus stellaris*, from a scattered company of migrating warblers, in the Battle River valley, six miles south of Camrose. This, I believe, is the first Alberta record for the species, and might be the northern and western limit of their distribution, as far as known. In his *Birds of Montana*, Mr. A. A. Saunders does not mention the Short-billed Marsh Wren as a Montana bird. That State lies immediately south of Alberta. Mr. N. A. Wood, in his *Survey of the Bird Life of North Dakota*, lists the bird for that State. Several breeding birds are recorded at Quill Lakes, by H. H. Mitchell, in his List of the *Birds of Saskatchewan*. These lakes are about 400 miles east of Camrose, and about 75 miles south of this latitude. With the increase in the number of ornithologists in the newer portions of the western prairies, birds which hitherto have been considered strictly eastern, or mid-continental, are being found in most unexpected places. As more is learned of the migration routes of such birds, it will most likely be found that they reach Alberta from the south-east rather than from the south.—FRANK L. FARLEY.

NATIONAL GAME CONFERENCE, NEW YORK, DECEMBER 5-6, 1927.—The following resolution *in re* the boundary waters between Minnesota and Ontario was passed by the Conference: *Resolved*, that conservationists and those who are interested in the preservation of the wilderness character of the scenic lake region lying in Minnesota and in Ontario, on both sides of the international boundary, the natural breeding place of game and a most entrancing resort for those who seek recreation in the solitudes of Nature, be urged everywhere, in Canada and in the United States, to interest themselves actively against the project, now under consideration by the International Joint Commission, to despoil the region by erection of dams along the boundary waters with consequent flooding of many miles of forest lands—and all for private gain with no adequate public benefit, but at the expense of the people.

GROWTH OF SHELL IN *Limnadia americana*.—In my discussion of this species (see *Canadian Field-Naturalist*, Vol. 35, p. 91), I omitted calling attention to the interesting observation made by E. S. Morse (*Proc. Boston Soc. Nat. His.*, Vol. XI, 1868, p. 404) that the concentric lines of growth upon the shell are margins of exuviations which instead of being discarded, are cemented together and retained upon the animal.—FRITS JOHANSEN.

THE WOODLICE OR *Oniscoidea* OF CANADA—ADDITIONS AND CORRECTIONS.—The section dealing with *Haplophthalmus danicus* Budde-Lind was unfortunately omitted from my paper on this subject which appeared in the November number of *The Canadian Field-Naturalist*. This species should number sixth in the list, following *Trichoniscus papillicornis*, and the next three species should thus be numbered 7, 8 and 9. The remaining species are numbered correctly.

The missing section is as follows:—

6. *Haplophthalmus danicus* Budde-Lund.

At the foot of the western bank of the Humber Valley about half a mile south of the Dundas highway, there is a miniature ravine, representing a dried-up watercourse. It is densely shaded and contains a quantity of limestone blocks and fragments. Under a few of these a considerable number of small, pale, and remarkably sluggish woodlice were found, which proved to agree exactly with Sars' description and figures of the above species. Specimens were collected on May 27th, 1927, and were observed also during late September.

This appears to be the first record of this species from North America.

Mr. Frits Johansen has kindly called my attention to Stuxberg's record of *Trichoniscus pusillus* from Niagara, which I overlooked, although it was mentioned in Mr. Johansen's paper (*Can. Field-Nat.*, xl, No. 8, 1926). This makes ten species listed by Johansen from Canada and Alaska, of which seven were recorded from Canada, if the Niagara record is a Canadian one.

Mr. Johansen also points out that Fee's records of *Ligidium gracile* were not from Departure Bay, but from Vancouver and Victoria, B.C.; and that the record of *Oniscus asellus* from Greenland is based upon insufficient evidence, this species never having been found there since Fabricius' time. This matter is discussed in Johansen's paper—E. M. WALKER.

NOTE ON *Kindleia* AND *Stylomyleodon* (FOSSIL FISH FROM CRETACEOUS DEPOSITS OF ALBERTA).—In the winter of 1916-27, I received from Dr. Edward M. Kindle of the Geological Survey of Canada, chief of the division of Palæontology, one of my former students; a great number of small fragments of a little fish, found by that tireless collector, C. M. Sternberg, in the bottom of a dried-out pond of Cretaceous age, about 100 miles from Edmonton, Alberta.

These brittle fragments consisted of parts of the head only with no trace of vertebrae or fins. However, as they were regarded by Dr. Kindle as characteristic forms, I ventured, at his request, to describe them, calling the species *Kindleia fragosa*. From their united pharyngeals I placed them near the family of Cichlidæ. This description was published in *The Canadian Field-Naturalist* for October, 1927, page 146, the article, as stated on the cover, having been issued on December 31, 1927.

In the American Journal of Sciences for February, 1928, (received at Stanford University on February 4th), a number of other fragments, apparently of the same species, were described by Mr. Loris S. Russell, of Alberta, under the name of *Stylomyleodon lacus*.

In the American Journal of Science for 1889, article XI, Dr. Othniel C. Marsh ("Discovery of Cretaceous Mammalia") described, from the Laramie of Wyoming, three small teeth resembling those of *Kindleia*, but somewhat laterally and unequally emarginate at tip. They are, according to Marsh, "evidently mammalian", and apparently pre-molars of a shrew. These are called *Platacodon nanus*. It is not likely that they belong to any fish.—DAVID STARR JORDAN.

FROG CALLING IN WINTER.—About 5 p.m. on November 26th, 1927, a party of London naturalists drove out to a favourite hemlock grove on the edge of Dorchester swamp to have a picnic supper. It was quite a mild evening, in fact the weather had been unseasonably mild for some time, and there was a hint of rain in the air. While preparing the fire and getting ready the meal we were considerably surprised to hear Swamp Tree Frogs calling (at least two of them) in different directions. They did not call very frequently but yet often enough so that there could be no mistake. The incident seemed rather unusual and possibly worth recording.—E. M. S. DALE.

MARSH HAWK HATCHES PRAIRIE CHICKEN.—In May, 1927, I found a female Marsh Hawk sitting on a nest of 12 Prairie Chicken's eggs. I passed within 10 feet of this nest many times. About the time I thought the eggs would hatch we had a bad rain and hail storm. As I had not been near the nest for 2 days, I went out after the storm and found only 5 eggs left. Two days later my wife went to the nest and found the hawk sitting on 1 Prairie Chick. When the hawk left the nest the chick ran some distance into the bluff. It was placed in the nest again, but was gone next day. (Male Hawk was on guard at all times.)—W. H. LAINE (Qu'Appelle, Sask.).

NEEDLE-FISH (*Scomberesox saurus*) FROM THE GULF OF ST. LAWRENCE.—I recently received from Mr. H. F. Lewis the head and tail of a specimen of the Needle-fish (*Scomberesox saurus*) which was washed ashore at Kégasha Bay, Saguenay County, Quebec, during a severe storm on August 16th, 1927.

The Needle-fish, or "skipper" as it is sometimes called, is a long slender fish with slender elongate jaws, belonging to the same order as the flying fish.

It is found in the Atlantic, Pacific and Indian Oceans swimming in large schools near the surface and is preyed upon by larger fishes such as cod, pollack, and tuny and also by porpoises. When pursued they leap from the water like flying fishes, often skipping along the surface for considerable distances. So large are the schools that as many as twenty thousand have been judged to be out of the water at one time skipping along the surface, and Day mentions the capture of 300,000 in a single haul in British waters. They average about one foot in length.—J. R. DYMOND.

A SNOWY OWL IN OTTAWA.—When passing along Wellington Street in the early morning of January 20th, 1928, my attention was directed to a large owl sitting in one of the trees below the West Block. Two city policemen had discovered it, and were trying to hit it with revolver shots, but I managed to scare it off, and it flew out over the river. I am quite sure it was a snowy owl (*Nyctea nivae*), with which species I am familiar from my visits to East Greenland and Arctic America.

As is well known, this high-arctic bird migrates southward in the winter, and there are a number of records of it also from southern Canada, including Ottawa. It is perhaps worth noting in this connection that the weather in Ottawa, January 18-21, 1928, was very cold, with a violent snowstorm the night of January 19-20.—FRITS JOHANSEN.

RECENT RECORDS OF THE EUROPEAN STARLING.—It is believed that records of observations of the European Starling, which show its spread into new territory, or its increase in territory already occupied should, when this can be done,

be placed on record so that the account of the development of this species in its North American environment will eventually be as complete as possible. It is for this reason that I desire to record briefly the observations stated below:—

On March 12, 1927, I observed 10 Starlings at Lindsay, Victoria County, Ontario.

On March 17, 1927, I observed 2 Starlings at Bedell, Grenville County, Ontario.

On April 2, 1927, I observed 3 Starlings about a bird box at Yarker, Lennox and Addington County, Ontario.

On May 11, 1927, I observed 2 Starlings at Megantic, Frontenac County, Quebec, near the border of the State of Maine.

Mr. Edmund H. Fletcher, of Point Edward, Lambton County, Ontario, at the outlet of Lake Huron, states in a letter, dated June 6, 1927, "The European Starling was seen here on May 20th for the first time. I have a nest, but cannot get my hand into the hole (in a telegraph post)."

On January 31, 1928, I observed 24 Starlings at Kincardine, Bruce County, Ontario, and was told that as many as 100 had recently been seen there at one time.—HARRISON F. LEWIS.



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The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first was *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July, and August. Its scope is the publication of the results of original research in all departments of Natural History.

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OTTAWA, CANADA.

MAY 15 1928

CANADA NORTH OF FIFTY-SIX DEGREES

THE LAND OF LONG
SUMMER DAYS

BY

E. M. KINDLE

GEOLOGICAL SURVEY
DEPARTMENT OF MINES
OTTAWA



THE OTTAWA FIELD-NATURALISTS' CLUB
OTTAWA, CANADA

P R E F A C E

THE VIVID word pictures and typical photographic glimpses from the facile pen and handy camera of Dr. Kindle of the Geological Survey of Canada, Department of Mines, included herewith, are well worth study by any one interested in our rapidly developing Dominion.

In recent months many men of wide vision in different countries, attempting to come to some conclusion as to just what parts of the world are likely to make the most striking progress in the next few decades, have very commonly fixed on Canada as the one country certain to witness very great development within her boundaries in the near future, and to judge by developments in the past few years that part of our country North of 56° is likely to be well to the front, if not in the lead, in the coming era of expansion and prosperity.

The Canadian Field-Naturalist, therefore, appreciative of the agricultural possibilities, at least, of this great Northland, has thought it worth while to give Dr. Kindle's informative article some measure of the publicity which it would seem to merit.

The possibilities of development in this great and largely unknown domain seem unlimited—live stock, forage crops, grain growing, fur farming, lumbering, pulp manufacturing, mining, fishing and hunting are just a few of the lines that open up.

It is for the man of vision to decide just what line his particular effort will take in this great Northland—any man's land.

FRANK J. NICOLAS, *Editor*.

EXPLANATION OF HALF-TONE ILLUSTRATIONS



FIG. 3—A. Eskimo (Nechillik woman). Northwest coast of Hudson Bay, page 54.

FIG. 4—Eskimo comic mask, page 55.

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FIG. 9—"Inside passage," Vancouver to Skagway, page 62.

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FIG. 31—A potato field near Dawson, Lat. 64, page 85.

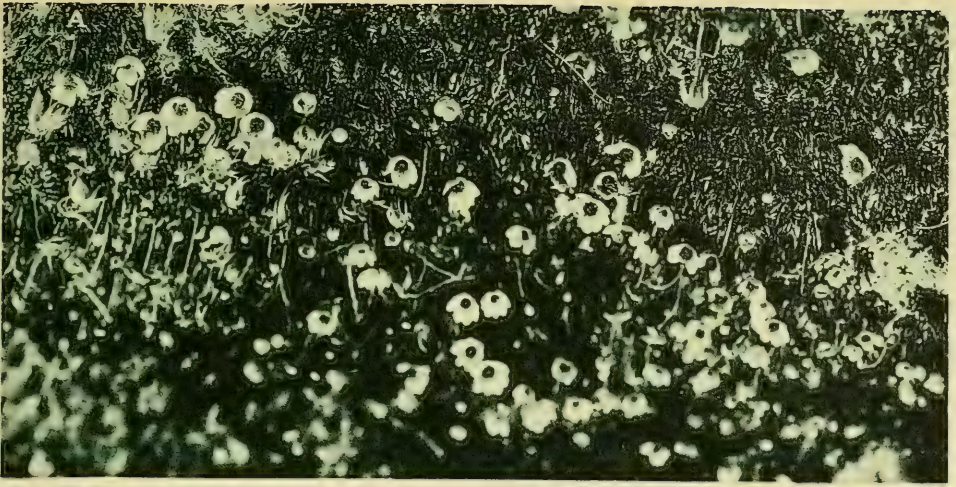


FIG. 1. (*Frontispiece*)—FLOWERS OF THE ARCTIC COAST.

A. *Dryas octapetala*, BERNARD HARBOUR, July 3 (top).

B. COTTON PLANT, HERSCHEL ISLAND (middle)

C. DAISIES, HERSCHEL ISLAND.

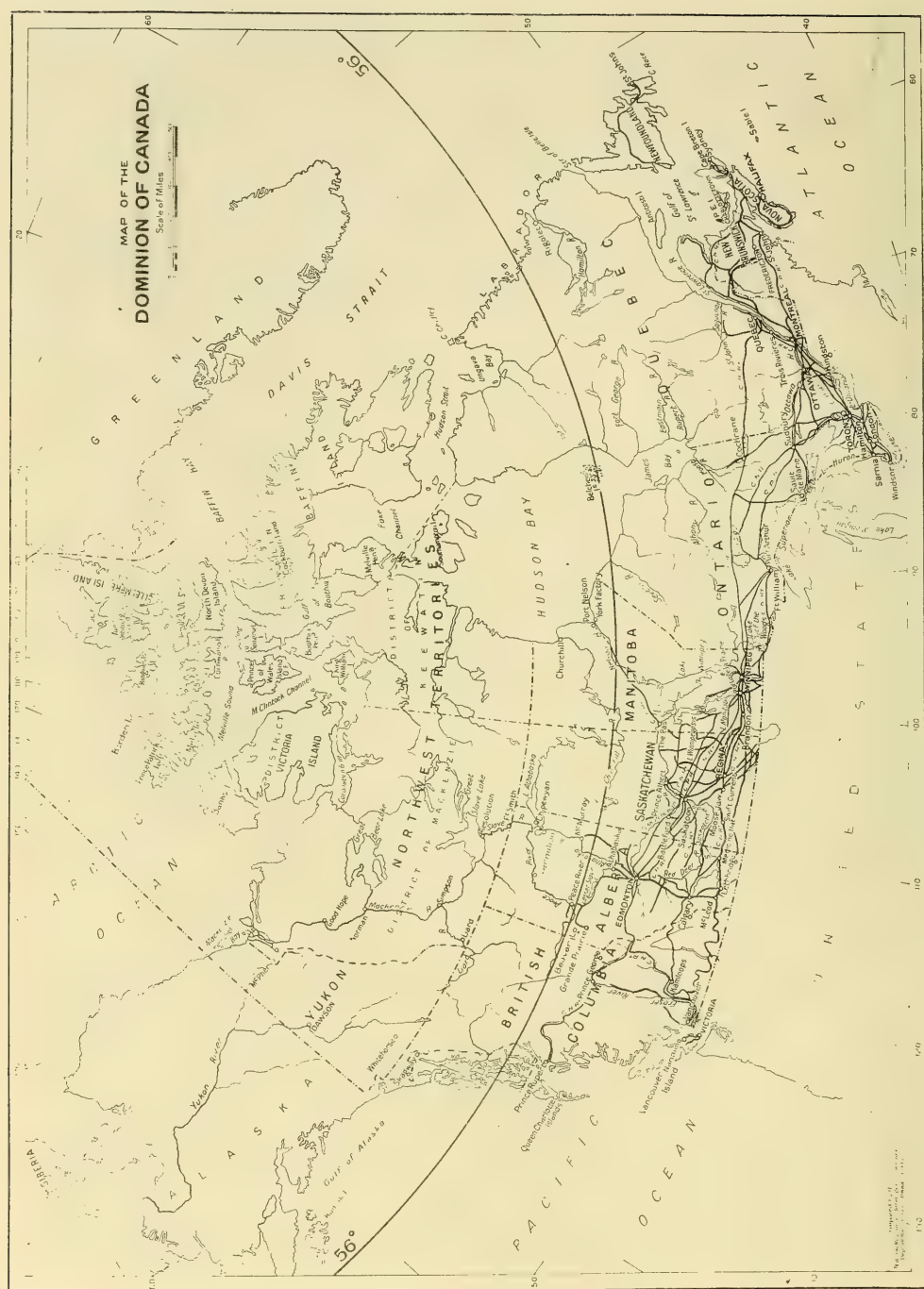


FIG. 2.—MAP OF CANADA.

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No. 3

^a CANADA NORTH OF FIFTY-SIX DEGREES*

The Land of Long Summer Days

By E. M. KINDLE

Geological Survey of Canada

NORTHERN LANDS have in the past been held in small esteem by the general public. A somewhat comparable failure to appreciate mountain scenery during the Middle Ages and earlier led men to avoid the Alps and other mountain regions of Europe which later became the playground of that continent and much of the rest of the world. The deep-rooted prejudice against Arctic and sub-Arctic lands enabled a few far-sighted Americans to acquire for the United States some sixty years ago the vast territory of Alaska for a sum less than the value of ten years' output of the Nome Beach gold field discovered twenty-five years later. In Europe, however, the old view that lands of the Far North are worthless is rapidly passing. Evidence of this is seen in the fact that Norway has acquired sovereignty over the large Arctic island of Spitzbergen and is developing its rich coal deposits and fisheries. The eastern coast of Greenland may be called fairly the most inhospitable land in the northern hemisphere. Only very skilful navigators can penetrate through the ice fields to the coast in midsummer; yet the ownership of this frigid coast, with its ice cap on land and nearly impenetrable floes on the sea, has recently been the subject of a long and rather bitter controversy between the Norwegian and Danish governments. A colony of west-coast Greenlanders has lately been successfully established by Denmark on the ice blocked east coast of Greenland.

The region which is here discussed has no precise boundary, but it may be defined in a general way as that part of Canada lying north of the present frontier of settlement. The northern border of this frontier is manifestly a highly irregular line which moves northward under the control of a variety of influences, among which are topographic features, climatic conditions, railway development and the dissipation of erroneous conceptions of northern Canada. The average position of this line in western Canada is near the 56th parallel of latitude. (Fig. 2.)

Northern Canada was long regarded as a fit abode only for fur traders and Eskimo. The fur trade was considered its only asset until some thirty years ago when the Klondike River valley began to pour out its flood of gold. The Klondike placers, during the first seven years of their development, produced gold to the value of more than \$100,000,000. The discovery since the early Klondike days of various other notable but less spectacular Eldorados near the northern frontier has led Canadians to revise their earlier valuation of their vast unoccupied and almost unknown heritage in the great Northwest. But the opinion still widely prevails that northern Canada is a desolate barren land of snow and ice which has little to tempt anyone except the prospector and the trapper.

The man who always searches for the worm in the apple, while granting that the prospector, miner or fur trader may be willing to spend a few years in northern Canada in the hope of winning a fortune, will deny that any highly developed social organization or large population can ever be expected in a land almost deserted by the sun in winter and which lies hundreds of miles north of such population centres as Winnipeg and Edmonton,—where the temperature falls about as low as the ordinary man cares to endure.

It must of course be admitted that the winter evenings are long and the hours of daylight few in winter north of lat. 56°, and any inquiry into the resources of northern Canada may well begin with a consideration of this oft cited bar to their

*In a Canada-wide competition organized by the late Sir William Price for the best essay on "The Geography and Resources of Canada, north of 56 degrees," this paper won the prize of \$1,000. It is now adequately illustrated, partly through the generosity of Mr. J. H. Price and the heirs of the Price Estate. Most of the illustrations used are from photographs by the Geological Survey of Canada which the author has been permitted to use through the courtesy of the Director. A map showing the recently established Labrador Boundary is included by the courtesy of the *Geographical Review*, published by the American Geographical Society of New York. The author is also indebted to the Director of the Dominion Experimental Farm, J. Hornby, R. A. Brook and Capt. Mills for the use of photographs, and to Mr. O. S. Finnie and the *Dearborn Independent* for the loan of plates.

development. The superb health and vigour of the northern Eskimo afford conclusive evidence that the long winter nights have no harmful effects. The Eskimo look forward to the dark midwinter period as a time for long visits to friends, and spend it in singing, dancing and social pleasures (Fig. 3). After ten winters in the Arctic, Stefansson reports the darkness of Christmas to be "about as depressing on the northern coast of Canada as the darkness of midnight on Broadway."

Each party puts forth its best actors, and strives in every way to outdo the other. During the first day, when the comic dances are on, the tribe succeeding in making the other laugh can demand anything they wish. The best dancers receive valuable presents. . . ."

"As each man entered he threw down a small gift before the *naskut*, as is customary on such occasions. As soon as everyone was settled, the dances began. Strange noises were heard in the tunnel, gradually approaching the room.



Fig. 3

There are few vaudeville shows which would not be outclassed in comic and novel features by some of the Eskimo dances of the Arctic coast. The following extracts from Hawkes¹ account of these dances will give some idea of the jolly life which the natives lead in the winter season.

"The 'Inviting-In' dances partake somewhat of the nature of the nith contests of Greenland.

Then a horrible looking wooden face was thrust up through the entrance hole, worn by the chief comic dancer of the Unalit. . . ." (Fig. 4.)

"A young woman appeared in the centre of the floor wearing a white reindeer parka and a girdle of reindeer hair tied around her waist. She began the conventional motions of the woman's dance, glancing nervously around her. Then men dancers, wearing fillets and armlets

¹. Can. Geol. Surv. Mem. 45, 1913, pp. 12-15.



FIG. 5. PROSPECTOR TRACKING UP A NORTHERN STREAM WITH DOGS.



FIG. 8. A. INDIAN CANOE ON LAKE MISTASSINI, LABRADOR.
B. LAKE MELVILLE, LABRADOR, Geological Survey of Canada, launch in foreground.

of wolfskin, leaped upon the *inlak* and surrounded her, jumping about and howling hideously. As the dance-song quickened, they became more and more excited, until the floor became one confused mass of shaggy heads and wildly tossing arms. The drums re-

tudes. The sub-Arctic island, Iceland, gives decisive evidence on this point. The history of the Icelanders clearly shows that the long winter nights have just the opposite effect and by giving people ample time for study and reflection greatly stimulate the intellectual life. Some of the old



Fig. 4

doubled the beat, until the *kazgi* fairly rocked under the volume of sound and the stamping feet. Then as suddenly as the pandemonium began, it ended. This was easily guessed as the wolf-pack pulling down a reindeer."

It might be claimed, however, in spite of the gay winter life of the Eskimo, that the long dark winter evenings would lead to mental stagnation in any white race which dwelt long in high lati-

Icelandic sagas, written centuries before the days of Chaucer, are models of style. Many of these remarkable literary productions were written when much of Europe was in the deepest barbarism and ignorance. It is reported on good authority that during the last hundred years no nation can show so large a proportion of literary men as Iceland. If we can judge from the record of Iceland for the last thousand years nothing

more serious need be feared from the effect of an Arctic environment on a people than the development of an uncommonly large percentage of poets.

The climate of northern Canada from some points of view is one of its greatest assets. The winter temperature in Arctic and sub-Arctic Canada will always discourage the immigration of the negro and other tropical races as unmistakably as it does the growth of bananas. It will, on the other hand, encourage the immigration of the Nordic races of Europe and raise the deterring hand to the leisure-loving races, whose motto is *Manana* (to-morrow). Canadian climate thus automatically selects the class of immigrants which the United States has recently attempted to secure by discriminative legislation.

Anyone with an intimate knowledge of climatic conditions in northern Canada is aware that its reputed severity has been—as Mark Twain once said of his reported death—greatly exaggerated. The popular misconceptions are so deeply rooted that it will require decades of education to eradicate them. It is almost universally believed by those who have made no special investigation of the matter that winter climate increases steadily in severity as the North Pole is approached, and that the Pole itself is coincident with the pole of greatest cold. This is about as far from the truth as would be the assumption that the rainfall of any region is proportionate to its distance from the sea coast, and rather recently has been shown to be as erroneous as the early idea that the magnetic and geographic poles were identical. Even as far back as the fifties of the last century, when Dove's charts of the isotherms for the northern hemisphere were published, it became evident that the North Pole and the pole of maximum cold were probably separated by a considerable distance.

It was observed long ago at Kola in Lapland that a north wind always caused an immediate rise in temperature. Baron F. P. Wrangel records that at his winter quarters at Nishne Kolymsk the temperature rose in winter with north winds. Dr. Kane noted the same fact at Rensselaer Harbour in Kane Basin, North Greenland. The most interesting feature connected with Captain W. E. Parry's temperature observations in the Arctic archipelago is the reported rise of temperature with a north wind.¹ The temperature records of Captain Parry,² who wintered at Melville island a century ago, show the lowest temperature reached to have been 55° below zero,

while northeastern Montana is credited with a minimum temperature of -68°.

Facts of this kind do not appear so surprising since it has become known that the cold pole of the world is located at Verkhoyansk, Siberia³, about 1,400 miles south of the North Pole, where the mean winter temperature is -48° in January. It is interesting to note that even at this coldest point in the world barley sometimes ripens and vegetables are grown in a small way⁴. To Canadians, the most interesting and satisfactory feature of this latest information concerning the pole of maximum cold is the fact that it is located neither in Canada nor at the geographical pole, but in Siberia. After the school geographies have had time to assimilate and broadcast this information, the popular mind will be prepared to look upon the future development of northern Canada from a new point of view.

A clear perception of the fact that latitude is a factor, but often the least important one, in controlling temperature is fundamental to any adequate evaluation of the potential resources of Arctic Canada. The following data derived from authentic sources should make this perfectly clear. The minimum temperature at Bernard Harbour, Arctic coast of Canada in Lat. 68°24' N. for the winter of 1915-16 was -46°⁵, or two degrees milder than the temperature at Fort Simpson, 550 miles to the south of Bernard Harbour. This Bernard Harbour minimum temperature is only one degree colder than the lowest temperature recorded for New England during a 30-year period preceding 1918 and the same as the lowest temperature observed in northern New York for the same period⁶. The comparison of Arctic coast temperature records with those from the interior of Arctic America makes evident the relatively mild character of the winter climate of the coast. The lowest temperature recorded at Point Barrow, Arctic coast of Alaska, during a period of 5 years was -50° whereas a temperature of -76° has been observed at Fort Yukon, 340 miles farther south, where the temperature mean for the entire month of December, 1917, was nearly 49° below zero⁷. The minimum temperatures⁸ recorded for the year 1900 at Herschel

³. Danckwört, P. W.—Siberien und seine wirtschaftliche Zukunft: Ein Rückblick und Ausblick auf Handel und Industrie Sibiriens (1921), *Geogr. Review*, vol. 13, p. 314, 1923.

⁴. Zenzinov, Vladimir M. With an Exile in Arctic Siberia: *National Geographic Magazine*, vol. XLVI, p. 701, Dec. 1924.

⁵. Johansen, F.; Vegetation along the Arctic Coast between Point Barrow and Bathurst Inlet: *Can. Arctic Exped., Rept.*, vol. V, Pt. C (MS).

Anderson, R. M.—Recent Explorations on the Canadian Arctic Coast: *Amer. Geog. Rev.*, vol. 4, p. 258, 1917.

⁶. Memo. from the U.S. Weather Bureau.

⁷. Memo. from the U.S. Weather Bureau.

⁸. Preble, E. A.—North American Fauna, No. 27, p. 35, 1908.

¹. Three voyages for the Discovery of a Northwest Passage from the Atlantic to the Pacific and narrative of an attempt to reach the North Pole. Vol. 1, p. 147.

². *Op cit.*, vol. 1, p. 169.



FIG. 12. A. TRAPPER'S CABIN, PEACE RIVER.

B. NAHANNI BUTTE IN THE FRONT RANGE OF THE ROCKY MOUNTAINS,
NEAR JUNCTION OF NAHANNI AND LIARD RIVERS.

C. INDIAN CABIN WITH SPRUCE-BARK ROOF, RESOLUTION, GREAT SLAVE
LAKE.

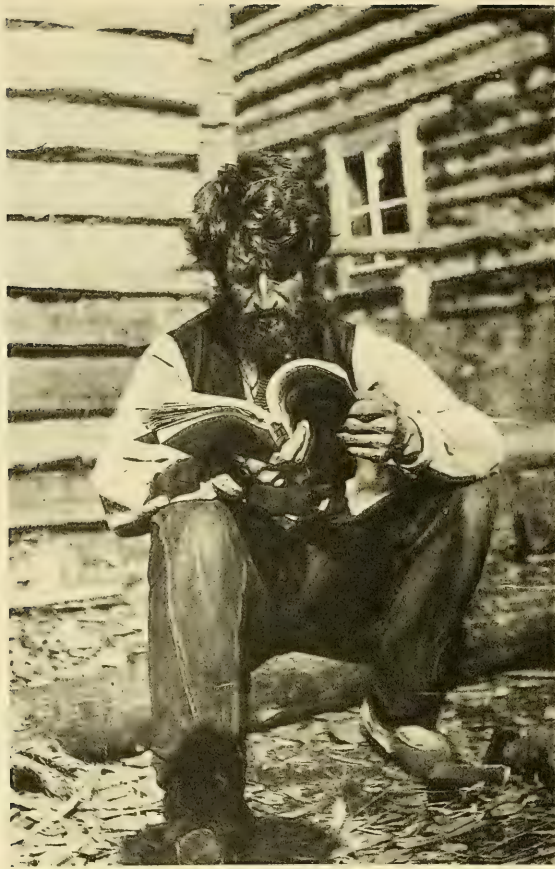


FIG. 13. OUTSIDE AND INSIDE VIEWS OF A MACKENZIE RIVER CABIN.

island at the mouth of the Mackenzie, McPherson 130 miles, and Good Hope 270 miles south of Herschel, were respectively -49.4° , -60° , and -62° , increasing in severity, it will be noted, from north to south as in the comparison between Point Barrow and Fort Yukon in Alaska.

Colorado claims to have a lake near the 40th parallel some 600 miles south of the Canadian border which is free of ice only one month in the year¹. South Dakota has a minimum temperature record of 50° below zero². The important fact to remember however in connection with the -50° temperatures of South Dakota and Northern Canada, is that all continental climates run to extremes. With a record of 50° below, South Dakota can some years indulge in tennis at Christmas, and the towns of sub-Arctic Canada and Alaska enjoy every winter the sport of dog races which sometimes cover a 300 or 400-mile course.

The summer climate of northern Canada is apt to surprise even well informed travellers who cross the Arctic Circle via the Mackenzie river for the first time. This is well illustrated by the testimony of Mr. Elihu Stewart, formerly Superintendent of Forestry for Canada, in his book *Down the Mackenzie and Up the Yukon*. "We had counted on escaping the usual July heat," Mr. Stewart writes, "but for the greater part it had really been more oppressive and certainly more constant, extending right through the long twenty-four hour day, than I had ever before experienced." Another author speaking of his experience northeast of Great Bear lake writes that all of his party agreed "We had never in our experience suffered as much from cold as we suffered from heat that summer." Ample confirmation of the impressions which the traveller in the North gets of the summer climate is furnished by the Weather Bureau records at Fort Yukon, just at the Arctic Circle, where temperatures above 90° in the shade are recorded nearly every summer. In the accompanying photograph of a prospector "tracking up a northern river" the panting dogs speak more eloquently than the Weather Bureau figures of the summer climate of the North (Fig. 5).

Even in the old Eskimo legends we find allusions to the summer heat. A legend concerning the contemporaneity of the mammoth and the Eskimo illustrates one method of escaping the heat resorted to by the natives. According to this old tradition, as recorded by Dr. Driggs,³

a hunter finding the weather extremely warm "sought the shelter of a cave, intending to await the passing of the heat of the day. He had not been long in the shelter before the sound of a heavy animal passing rapidly over the earth greeted his ears, and on looking out he saw a mammoth in full flight, the huge creature exhibiting great fear as it was being chased by a thin short-haired wolf."

The "frozen north" has for a number of years been retreating northwards. Like the "great American desert" which constituted the major portion of the United States west of the Mississippi river, according to the geographies of sixty years ago, the "frozen north" is destined to shrink to very small proportions.

From this general discussion of the misconceptions which have hindered or delayed recognition and development of the resources of Arctic Canada we may pass to a consideration of some of the larger natural geographical divisions of the great Northland.

LABRADOR PENINSULA

EARLY EXPLORATION AND SETTLEMENT.—Labrador peninsula has the paradoxical distinction of being the first discovered and the least known part of North America. Since its bleak shores were visited by the Norseman, Bjarne Herjulfson, in 986, and by Lief, son of Eric the Red, in 1000, Labrador has attracted only a few thousand fishermen. The flood of emigration from the Old World has flowed to the south and left this great Northland untouched save by the fishermen, who occupy during the summer widely scattered sites along the eastern coast. The reason for this neglect lies in the fact that the sea bordering Labrador on the east is the great highway by which the ice from much of Arctic America and western Greenland travels southward in summer under the influence of an Arctic current. This current keeps vast ice fields moving down the coast till late in the season, and gives to even the southern parts of "the Labrador" a polar climate in mid-summer.

The English navigator, John Cabot, who rediscovered Labrador in 1497, returned with glowing accounts of the abundance of the cod fish there. English, French, Spanish and Portuguese fishermen soon verified and utilized the immensely rich fisheries discovered by the Cabots. These have been continuously exploited down to the present.

Jacques Cartier and Martin Frobisher were among the early navigators who visited the coast of Labrador. Cartier stated that there was "not one cartload of earth on the whole of it".

¹ Robert S. Yard. *Glimpses of our National Parks*, Dept. of Interior, Washington, p. 10, 1916.

² Freenian Ward. *Geogr. Review*, April, 1927, p. 246.

³ Driggs, John B.—*Short Sketches from Oldest America*: Geo. B. Jacobs & Co., Phila., 1905, pl. 83.

He added, however, that "if the land were as good as its harbours it would be a good country."
The Hudson's Bay Company began in 1827 to

Labrador, crossing from Ungava bay to Hamilton inlet and discovering the Grand falls of the Hamilton river.

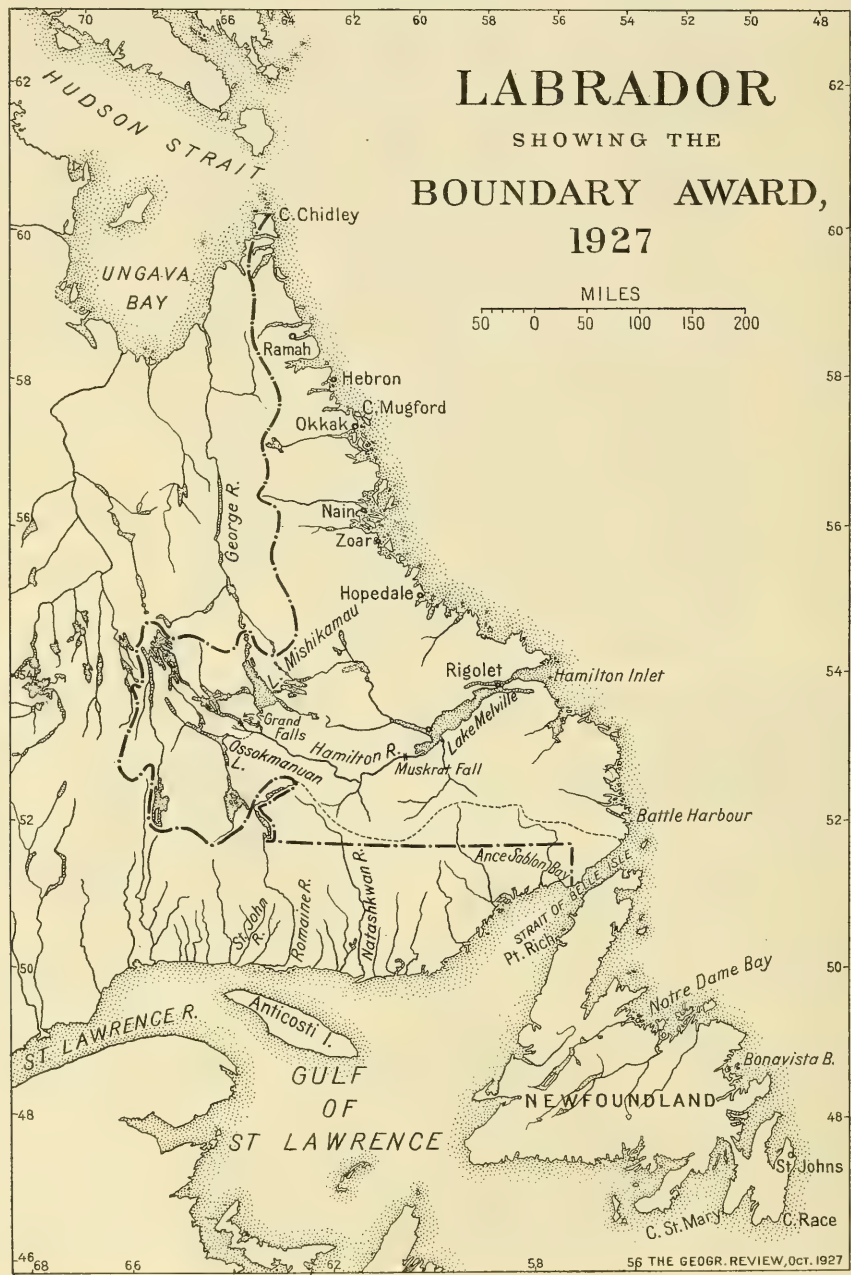


Fig. 6

establish trading posts in Labrador. Their first post at Rigolet was opened about 1837. John McLean¹, an agent of the Company, made in the years 1838 and 1839 extensive journeys in

Our knowledge of the geology of the interior of Labrador dates from Low's work in the early

¹ McLean, John.—Notes of a Twenty-five Years' Service, in the Hudson's Bay Territory, vol. II, p. 116, 1849.

nineties. His report¹ is the only one which deals with the Labrador peninsula as a whole, and it represents by far the most valuable scientific work which has been done in the interior.

Mrs. Leonidas Hubbard² is one of the notable later contributors to the geography of eastern

river to Ungava bay, and published a map of the waterways traversed.

LABRADOR BOUNDARY.—All the coast of which Cartier spoke in such uncomplimentary terms and much besides was given to Newfoundland by the terms of the recent Boundary decision



Fig. 7A



Fig. 7B

Labrador. She traversed Lake Melville and Grand lake, the Naskaupi river and the George

¹ Low, A. P.—Report on Explorations in the Labrador Peninsula. Can. Geol. Surv. vol. VIII, 1895-1897.

The settlement of the Boundary dispute assigns to Newfoundland Labrador the whole of the

² Labrador from Lake Melville to Ungava Bay: Amer. Geog. Soc. Bull., vol. 38, pp. 529-539.

Hamilton River basin and the eastern side of the George river. This leaves Canada a vast and little known area including all of the peninsula which drains into Hudson bay. The boundary line separating Newfoundland Labrador from Canadian Labrador is shown in the map, figure 6.

THE PEOPLE.—A Frenchman of parts, who had chosen the bleak coast of Labrador for a home, once described it in explanation of his choice as "a country with no fees, no lawyers and no taxes." This terse description, though written a century ago, still fits the country. Although located in the same latitude as the British Isles and having more than twice their area, the Labrador peninsula has a total permanent population less than that of a small Ontario city.

The people of Labrador peninsula belong to four groups: the Newfoundland fishermen, who spend only the summer on the eastern coastal strip belonging to Newfoundland, which is known as "The Labrador"; the Eskimo; the Indians, and the "liveyerers" or half-breeds. It is the cod fisherman from Newfoundland and his picturesque shack, always located on the shore, that first catch the eye of the visitor from the south. One of the largest groups of these fishermen is located at Indian Harbour, a centre of the cod fishing industry. Salmon fishing, which is, after cod fishing, the most important occupation of the east coast, is carried on chiefly by the "liveyerers" about the mouths of the rivers in the waters of Lake Melville and in the fiords farther north.

Labrador was divided originally between the Indian and the Eskimo, the former holding the interior, the latter the coastal strip. The Eskimo are now nearly extinct in the Hamilton Inlet region and southward. The territory formerly held by the Eskimo was approximately the same narrow shore zone now occupied by the Newfoundland and French-Canadian fishermen, but all the vast interior river and lake region belonged to the Indian. When the white man first came to the Gulf of St. Lawrence, the Eskimo held the narrow coast strip as far west as Mingan opposite the western part of Anticosti island. The acquisition of firearms from the French enabled the Indians in 1600 to drive the Eskimo eastward to the Strait of Belle Isle. Since then the Eskimo has retreated very slowly to his present southern limit at Hamilton inlet. From this point northward the widely spaced groups of Eskimo still occupy the coast and extend westward along the shore of Hudson strait and southward along the eastern side of Hudson bay as far as Cape Jones. South of this point the few native inhabitants on the coast are Indians.

The Indians of the eastern part of the Labra-

dor peninsula belong to two distinct tribes—the Montagnais of the south, and the Naskaupis of the north. The Hamilton river and Lake Melville form in a general way the boundary between the hunting grounds of these two Indian groups (Fig. 7).

According to the estimate of the Dominion Department of Indian Affairs, the total number of Montagnais Indians who came to the southern coast of Labrador in 1908 was 694. All these with the exception of the few too decrepit to travel, spend the greater part of the year in the interior. The summer journeys in search of caribou and other game often take them a very considerable distance along the rivers and lakes. All of them make a spring or summer trip to the coast where they dispose of the winter's catch of fur and secure supplies from the traders.

The Naskaupis, who occupy the George River basin to the north of the Montagnais territory, show less inclination to visit the trading posts than the Montagnais. McLean said of them that "of all the Indians I have seen, the Naskaupis seem most averse to locomotion; many of them grow up to man's estate without once visiting a trading post.¹" They now come to the coast to trade at two or more points.

In the old days when the time-honoured boundary between Indians and Eskimo was overstepped by either race, savage reprisals resulted. Battle Harbour is one of the names which has survived from the days when the Indian and Eskimo tried to revise the inter-racial boundary with the tomahawk and the spear. The Indian still lives as his ancestors did, except that canvas canoes and tents have supplanted the birch bark canoe and the skin-covered tepee.

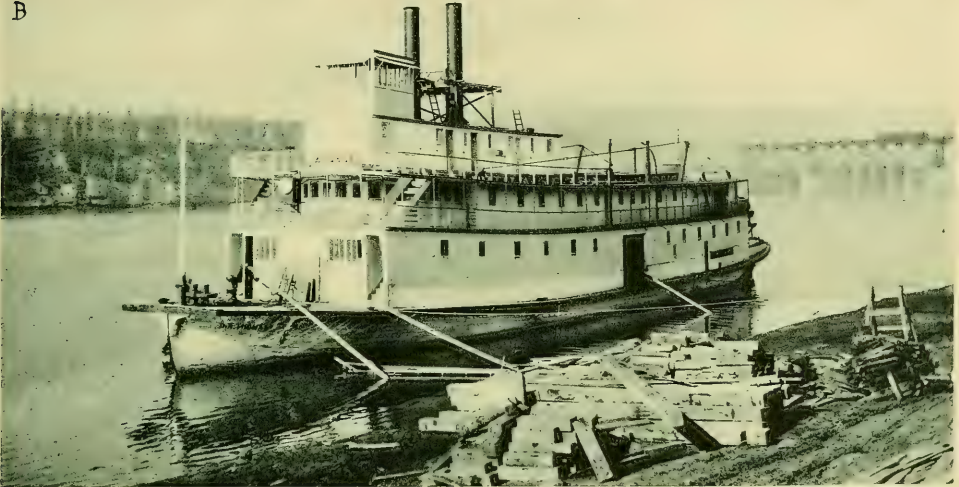
CLIMATE.—The coastal strip and the interior of Labrador present a surprising climatic contrast. This is due chiefly to the influence of the Labrador current, which carries a stream of floating ice and bergs southward along the entire eastern coast of Labrador. Throughout the most of July the vast ice fields move steadily southward, giving rise to a sub-Arctic temperature over the western side of Davis bay and the adjacent coast, as far south as the Strait of Belle Isle. The ice-chilled narrow coastal zone of islands and sea-facing mainland, called "The Labrador" by the cod-fisher, is practically treeless. Only a short distance inland, however, this gauntness gives place to the heavy forestation of the interior valleys where a summer climate replaces the frigidity of the coast and offers the great contrast con-

¹ McLean, John.—Notes of a Twenty-five Years' Service in the Hudson's Bay Territory, p. 119, London 1849.

A



B



C



FIG. 14. A. BIRCH-BARK CANOE WITH HUDSON BAY BLANKET SAIL,
MACKENZIE RIVER.

B. S.S. *D. H. Thomas* AT PEACE RIVER CROSSING.

C. SCOW BRIGADE, ATHABASKA RIVER BELOW GRAND RAPIDS.



FIG. 15. A. INDIAN SUMMER CAMP AT SIMPSON, MACKENZIE RIVER.
 B. BIRCH-BARK CANOE UNDER CONSTRUCTION, HAY RIVER, GREAT SLAVE
 LAKE.
 C. INDIAN FEAST IN FRONT OF ROYAL CANADIAN MOUNTED POLICE
 HEADQUARTERS AT NORMAN.
 D. HUDSON'S BAY COMPANY RESIDENCE AT FORT GOOD HOPE ON THE
 LOWER MACKENZIE, NEAR THE ARCTIC CIRCLE.

cisely summed up by Holme¹ in the statement that "a journey of twenty or thirty miles in summer-time up the country from the sea is like passing from winter to summer."

At Rigolet, near latitude 54°, where the temperature is moderated by the open sea, the thermometer has rarely registered 40° below zero in winter. During the summer of 1921, snow was absent from the mountains about Lake Melville during July and August, except for very small patches at elevations above 2000 feet.

Mr. Davies², writing from experience gained by residence at Northwest river, near the head of Lake Melville, states: "The heat, in summer, is often great, though it seldom lasts beyond a single day at a time. I have seen the thermometer as high as eighty-six degrees, at four o'clock p.m., and once, on the 21st August, 1840, it rose as high as ninety-four degrees in the shade." Navigation, according to Davies, is open in Lake Melville about the first or second week in June. "By the latter end of November the Bay is generally frozen over." Grand lake, because of its great depth, "rarely freezes over before the middle of December, nor does it break up till the middle of June."

FORESTS AND VEGETATION.—Black spruce (*Picea mariana*) is the predominant tree throughout the Lake Melville district, but white spruce becomes increasingly common as one proceeds westward or inland. The white birch (*Betula pendula*) is a very common tree, and in tracts which have been burned over it has taken possession of the ground to the exclusion of all other trees. The largest observed specimens of the birch, however, were found sparsely distributed in forests of black and white spruce.

Where the birch constitutes the whole of the forest, its light green foliage distinguishes it at considerable distances from the darker evergreen forests. The forest colour effects vary with the illumination and the distance from the observer. Under a grey sky the black spruce forests appear nearly black in the middle distance, dark green in the foreground, shading off into deep dark blue in the distance. Under a half-clouded sky the forested mountain slopes are marked with blotches of dark blue on a field of light green, the colour scheme changing constantly with the shifting of the clouds. Sometimes at the finish of a

shower a spruce-covered island, rainbow-arched, will furnish a picture not easily forgotten. Labrador has been very appropriately described as the land of rainbows. (Fig. 8B). In many places sphagnum moss into which one sinks to the knees, carpets the ground in a Labrador forest. When this is absent caribou moss often replaces it, and where the trees are not too closely spaced the ash grey of the moss gives a colour contrast to the dark green of the spruce visible at a considerable distance.

These observations on Labrador forests apply to a region in latitude 54° with which the writer is personally acquainted. But the observations of Mrs. Leonidas Hubbard, whose journey extended through Lake Melville and north to Ungava bay, indicate that along the north-south valleys forests continue to show fair-sized trees up to latitude 58° and even beyond. She reports having seen one tree with a circumference of nine feet, and states that "the valley is mostly well wooded with spruce and balsam as far as Mabelle island, and here the spruce reaches splendid size." According to Turner¹ at Fort Chimo, about latitude 58°30' the walls of the buildings are constructed of the larger logs from the local forests, where the trees seldom exceed 10 inches in diameter. On the Whale river trees attain a height of 30 to 50 feet within two miles of Ungava bay.

On the mountain slopes and over much of the plateau region the forests of the river valleys are replaced largely by lichens, emerald green moss and a considerable variety of flowering plants. Trees when not entirely absent are often represented by a variety of Arctic willow, and a dwarfed birch, with branches seldom rising more than two or three inches above the rock crevices that protect their roots. Certain types of upland afford dwarfed spruce not higher than a man's shoulders and others yield trees 15 to 35 feet high.

Away from the valleys in Labrador, mosses, lichens, dwarfed larch, willows and alders quickly replace the forests. Nearly everywhere the white blossom of the Labrador tea is seen during July. As its blossoms fade the dark pink lambskill takes its place, decorating the woods with a profusion of delicate colour throughout the latter part of the summer. About the first of August the half ripe low-bush cranberries begin to show rosy cheeks above the moss and a little later the rich dark purple bearberries and blueberries spread a feast of delicious fruit and ravishing colour on the grey rocky summit of every hill and moun-

¹ Holme, Randle F. A Journey in the Interior of Labrador, July to October, 1887: Proceedings of the Royal Society, vol. X, p. 189, 1888.

² Davies, W. H. A.: Transactions of the Literary and Historical Society, Quebec, pp. 76 and 84, Feb., 1843.

The writer was informed that Grand lake generally freezes over after Christmas and that frost seldom comes in the Grand lake valley till October.

¹ Turner, L. M.—11th Ann. Rept., Smithsonian Institution, Bureau of Ethnology, p. 173, 1894.

tain. The wild currant, crowberry and baked-apples are among the other refreshments which the hill tops set before their visitors.

MINERALS.—The Labrador peninsula has nearly the area of Alaska and it is in about the stage of exploration and economic development which had been reached by that other great peninsula when Russia sold it to the United States, as a supposedly worthless possession, for seven and a quarter million dollars. But it is not easy for any geologist, who has for a season felt the spell of this vast and very slightly explored land, to avoid suggesting that there are reasons for believing Labrador will eventually contribute to the world's supply of mineral wealth. Neither the fishermen nor the fur traders have ever sought to develop any other wealth in Labrador beyond that furnished by the cod and the pelts. They have, however, given a few hints to the prospector which have thus far remained unheeded.

As early as 1840 a chunk of native copper was found on the shore of Hamilton inlet. Its source remains unknown. The first intimation of the existence of the famous Michigan copper district came from the farmers of the Central States who picked up pieces of native copper in their fields long before the location of their source was known. In the Lake Melville district there are various half-breed trappers (the "liveyers") who have specimens of chalcocite and other copper ores which they found near trap lines in the interior. Low found extensive deposits of magnetite and other ores of iron at several points in Labrador¹. But thus far little if any attempt to ascertain their commercial possibilities has been made. Very extensive beds of banded iron ores also occur on the Nastapoka islands, which extend along the east side of Hudson bay for a hundred miles north of Little Whale river.² Dr. Bell and Mr. Low record the occurrence of a vein of galena on the west coast of Labrador near Richmond gulf. On the same coast Low found pyrrhotite containing small quantities of nickel.

Professor A. P. Coleman of Toronto University, who has a personal knowledge of north eastern Labrador as well as an intimate knowledge of the mining districts of northern Ontario makes the following significant statement and prediction: "It may be said that the largest area of relatively unexplored territory in this northern hemisphere is to be found in northern Quebec; it consists of Precambrian rocks like those which include the rich mines of gold, silver, iron and

copper of Lake Superior and northern Ontario. The land is almost unoccupied and means of communication are difficult; yet, in the opinion of the writer, the next great development of mining industry is likely to occur in Quebec and spread northward and eastward into Labrador"¹.

The mining engineer may be reminded that while the Labrador coast-line was the first part of North America to be seen by Europeans, most of the interior is still practically an undiscovered country. The use of the aeroplane should soon inaugurate a new era in the exploration of the interior. The thousands of lakes which are scattered throughout the peninsula furnish peculiarly favourable conditions for the use of the hydroplane in Labrador. It is a region where vast areas of bare rock give the prospector exceptional opportunities. It is a country which can be recommended to the prospector who has the skill to combine trapping and prospecting. The men who can do this have the certainty of a living from their traps and fair chance of proving that old Jacques Cartier was slandering the country when he called it the "Land that God gave to Cain."

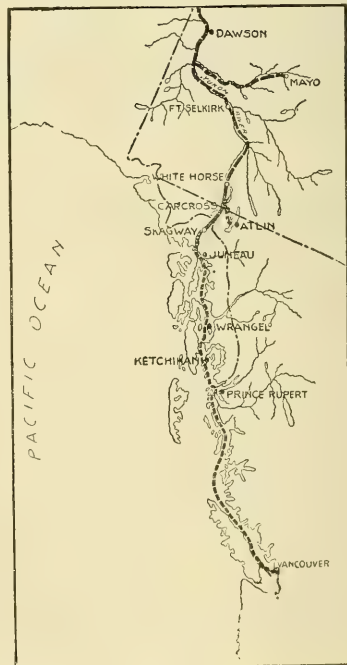


Fig. 9

NORTHWESTERN CANADA

HISTORICAL REVIEW.—Much of the vast region which stretches from Hudson bay to the Alaskan

¹ Low, A. P.: *Op. cit.*

² Low, A. P., *The Cruise of the Neptune*, Gov. of Canada, pp. 239-245, 1906.

¹ Coleman, A. P., *Mining Possibilities in Labrador*, *Can. Mining Journ.*, vol. XLV, p. 870, 1924.

boundary north of latitude 56° is still imperfectly known. Only the larger rivers and lakes have been traversed and charted. Service's brief description is the best that can be given to much of it:

*"There's a land where the mountains are nameless
And the rivers all run God knows where."*

Two of the great river valleys of the continent, the Yukon and the Mackenzie (Figs. 2 and 22,) with the mountain systems adjacent to them, comprise the prominent physical features of the western half of this enormous section of Canada, while the Arctic Prairies, which are sometimes called the Barren Lands, constitute the major portion of the eastern half.

The history of the early exploration of this part of Canada, like most other parts, is closely bound up with the history of the Hudson's Bay Company. The Great Company, as it has often been called, initiated much of the early exploratory work in northwestern Canada. The Northwest Company contributed largely to the exploratory work for a time. The coalition of the two companies in 1821 ended their bitter rivalry in the fur trade. Space does not permit recounting the important Arctic discoveries of such men as Hearne, Dease, Simpson, and Dr. John Rae. The exploration by Alexander Mackenzie of the great river which bears his name was done under the auspices of the Northwest Company. Mackenzie reached the mouth of the river in July 1789, a little more than a month after his departure from Fort Chipewyan on Lake Athabaska, in spite of the predictions of the Indians that old age would overtake him before the consummation of his journey. It was the exploratory work of Mackenzie, Davis, Thompson and others who were connected with the fur trade which prepared the way for the line of far-flung trading posts extending from York Factory and Churchill on Hudson bay to Fort Yukon on the Yukon river.

In the Northwest the Hudson's Bay Company has reversed the usual order in which civilization entrenches itself in a new land. This is, according to a familiar axiom, first the missionary, then the soldier, then the trader. Here the trader anticipated the missionary and used so much tact and diplomacy in his dealings with the Indian that the soldier was not needed. This historical sequence has led certain irreverent ones to interpret to tourists the meaning of the widely displayed and somewhat mystical initials H.B.C. to signify "Here before Christ". The influence of the company in promoting friendly relations between the Indians and the whites as well as between different Indian tribes cannot be questioned.

Nor can the effect of the Company's activities in holding western Canada for the British Empire before the days of Federation be doubted.

The Mackenzie river has been familiar to fur traders for more than a century as part of a great system of transcontinental waterways by which one can travel by canoe or York boat from the Atlantic to the Pacific oceans (Fig. 14). The principal links in this chain of northern rivers are the Churchill, the Athabaska, the Mackenzie and the Yukon. Long before transcontinental railways were dreamed of, many thousands of tons of merchandise were conveyed in York boats and scows, via Hudson bay, over these great rivers and the short portages connecting them, to be offered to the Indians of the interior in exchange for furs.

The great value of the furs which the northern forests yield was known to these hardy traders more than fifty years before the mineral wealth of the country was suspected. In order to gather the rich harvest of furs in the Yukon valley, the Hudson's Bay Company established a trading post at Fort Yukon in 1847. From this point Fort Selkirk, several hundred miles up the Yukon in Canadian territory, was supplied. The cargoes of supplies which came down the Porcupine from the Mackenzie were tracked up the Yukon in big bateaux by Indians. Fort Yukon remained an important trading post of the company until 1867. After the purchase of Alaska by the United States, Fort Yukon was found to be west of the boundary. It was accordingly abandoned by the Hudson's Bay Company and the post was moved up the Porcupine about 150 miles to a site supposed to be on British territory. The accurate location of the boundary later necessitated a second move of the post.

The single name—Northwest Territories—which formerly included all of the region now under consideration has been superseded by four names—District of Keewatin, District of Mackenzie, District of Franklin and Yukon Territory.

GEOGRAPHICAL FEATURES.—The population of the Yukon valley is chiefly centred near the Klondike mining district at Dawson. Elsewhere white men are sparingly and widely scattered throughout the mountain valleys in prospectors' cabins. The Yukon valley, like that of the Mackenzie, is forested throughout its length. Toward the north the trees, though small, are suitable for building cabins and for fuel. A small Indian population is scattered through the Yukon basin in small groups.

Eskimo occupy widely separated areas along the Arctic coast near the mouth of the Mackenzie river and in the Coronation Gulf region.



Fig. 10



FIG. 16. A. A SUMMER DOG TEAM.
B. A NOON HALT FOR TEA, CROSSING GREAT SLAVE LAKE.
C. ARCTIC COAST ESKIMO ON A JOURNEY.

A



B



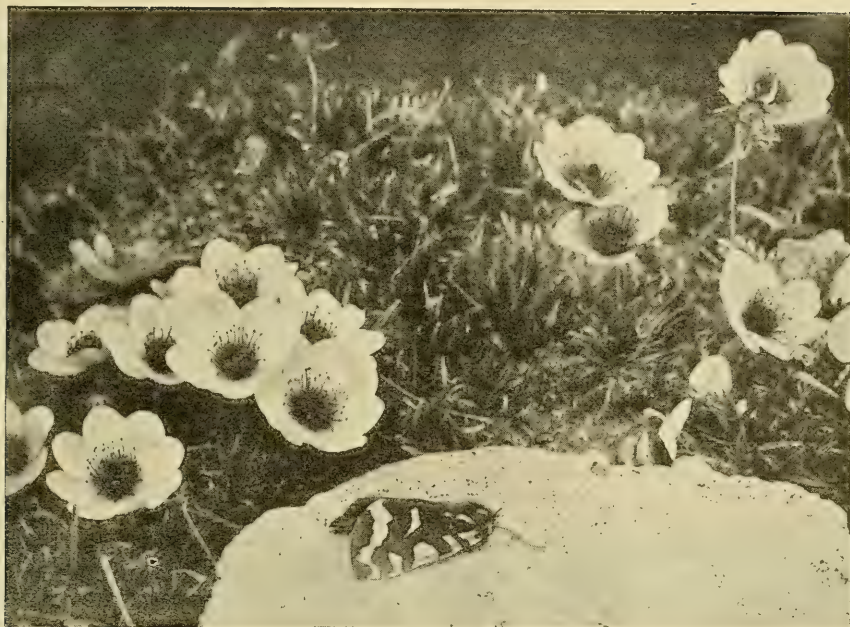
C



FIG. 17. A. VIEW DOWN SLAVE RIVER FROM FORT SMITH.

B. SPRUCE FOREST, LOWER SLAVE RIVER.

C. VIEW FROM SHORE OF GREAT SLAVE LAKE.

*Fig. 11*

They also occupy points favourable for hunting and fishing on the west coast of Hudson bay, north of Churchill, Chesterfield inlet, and the shores of the large lakes southwest of Chesterfield inlet. The remainder of the Arctic Prairies is uninhabited except for a few small bands of Indians about the eastern ends of Great Slave lake and Athabaska lake.

Since there are no roads and very few trails, travel in the Mackenzie valley is strictly limited to the waterways. Everywhere dense forests of spruce and poplar, muskeg or small lakes cover the lowlands near the rivers. These generally render travel across country nearly impossible or extremely slow.

In all of the 1200-mile stretch of lake and river between the end of steel at McMurray and Norman (Fort Norman) the traveller will see only eight or ten Indian villages with two or three fur-trading stores at each to interrupt the virgin forest (Fig. 11). The total population of the entire Mackenzie district will probably not exceed 5,000. Probably less than 150 of these are whites, the remainder being Indians, except 200 or 300 Eskimo. Anglican or Roman Catholic missions are maintained at nearly all of these villages.

The Indians depend for a livelihood entirely on trapping, hunting and fishing. At the trading posts the tea, flour, sugar, tobacco and a few other things which the white man has taught them

to regard as essential to their welfare can be obtained in exchange for the winter's catch of fur—lynx, fox, marten, etc. The relative abundance of the lynx fluctuates from year to year in a very curious way. The supply of rabbits is an important matter to the lynx, since they are his main source of food, and the failure of that supply means the starvation of a large part of the lynx of the region. Not a single rabbit was seen during the writer's trip down the Mackenzie in 1917. The naturalist, Edward Preble, who traversed the Peace and Slave rivers in 1903, found rabbits very abundant and records having seen nearly forty in one day. During the same year the abundance of lynx in the region was attested by the hundreds of lynx pelts traded in at Fort Simpson. According to general report, periods of great scarcity and great abundance of the rabbit population follow each other at intervals of about seven years (Fig. 12).

The wolf is less dependent on rabbits than the lynx, but it, too, no doubt suffers in the lean years.

A superstitious fear of wolves prevents many of the Indians from killing them, notwithstanding the generous government bounty. The basis of the truce between the Indian and the wolf has been stated thus by one chief: "A long time ago the wolf was the man's dog, and they hunted the moose equally. But the man began to take more than his share, and the wolf was angry. He

began to hunt for himself and he found he did not need the man's help. Ever since then the man and the wolf have hunted the moose separately. But before they parted they made a treaty. The man agreed never to kill the wolf, and the wolf agreed never to break into the man's caches."

The Royal Canadian Mounted Police is represented by about fifty non-commissioned officers and men distributed throughout the Mackenzie valley. Two Government Indian agents, who are also mining recorders, reside in this district.

The Mackenzie River valley includes a wide variety of scenery. Anyone who can feel the pull of the great Northland, and who wishes to see what lies beyond the northern outposts of civilization, can hardly fail to enjoy a summer trip to the lower Mackenzie, provided he does not expect the kind of accommodation furnished by the boats on the St. Lawrence or Hudson rivers.

The Mackenzie is everywhere a majestic and impressive river. Ordinary rivers appear insignificant in comparison with it. Certain portions of the river are known by special designations. Some of these afford in themselves good brief characterizations of the essential features of the river along the portions to which they apply. The Long Reach is one of these. The name includes the nearly straight 80-mile stretch of river which skirts the foot of Bear range north of Norman. This part of the river has an average width of one mile and a current rate of 3 or 4 miles an hour. The narrowest part of the river is found in the Ramparts, a gorge 100 to 180 feet deep and about 5 miles long cut through the nearly flat-lying limestone above Good Hope. The name "Grand View" applies "to an expanded portion of the lower Mackenzie about twenty miles in length. The river here is almost straight, but curves gently to the north, and is from two to three miles wide. Its great width gives it more the appearance of a lake than river, and in no other part of the Mackenzie is the magnitude of the mighty volume of water which this river carries to the sea impressed so forcibly on the mind."

TRANSPORTATION.—The Yukon river has a length of 2200 miles from its source to the sea. It is free from ice from June 1 or a little earlier to October 1 or later. The Northland still remains in the hands of the fur trader, but the canoe brigades and the York boats have given way to the steamboats on the large rivers. On the Yukon the steamboat has followed the successful prospector from its mouth in western Alaska to the head of navigation at Whitehorse rapids in the Yukon territory. From this point to the sea at Skagway the White Pass and Yukon railway now follows the trail over which poured

many of the gold seekers who participated in the rush to the Klondike in the late nineties. Its northern terminus at Whitehorse near lat. 61° is the most northerly point reached by rail in Canada. In Norway, railway travel is possible north of latitude 68° , more than 100 miles north of the Arctic Circle. The 900-mile sea trip (Fig. 9) from Vancouver to Skagway behind a continuous fringe of forest-clad mountainous islands affords probably the longest sea voyage in the world in which the voyager has certain immunity from sea-sickness. Here the traveller may steam toward the land of the Midnight Sun over a sea placid as a lake, and enjoy a visit to the Taku glacier in such commodious vessels as the Canadian National Steamship *Prince George*. It is doubtful whether any journey in North America can equal that from Vancouver to Dawson for variety and charm of scenery (Fig. 10).

The Mackenzie valley has never felt the quickening touch of gold, and the steamer service on it was initiated for and is still maintained by the fur traders. Any approach by rail to the Peace or Athabaska rivers, which are the great waterways leading toward Great Slave lake and the Mackenzie, must be through the city of Edmonton. This thriving modern city was not many years ago only an obscure trading post of the Hudson's Bay Company on the Saskatchewan river. A railroad was completed a few years ago from Edmonton to Peace River Crossing on the Peace river, which is about 312 miles northwest of Edmonton. Another railroad extends north from Edmonton via Lac La Biche to the head of navigation on the Clearwater river. This railway ends near McMurray: from that point to the Arctic coast steamer navigation on the Mackenzie is interrupted at but one point, the rapids at Fort Smith, where there is a portage of 16 miles (Fig. 27B). The Peace River route is longer and involves a four-mile portage at the Vermilion chutes, which the McMurray route avoids, but the railway transportation is more dependable.

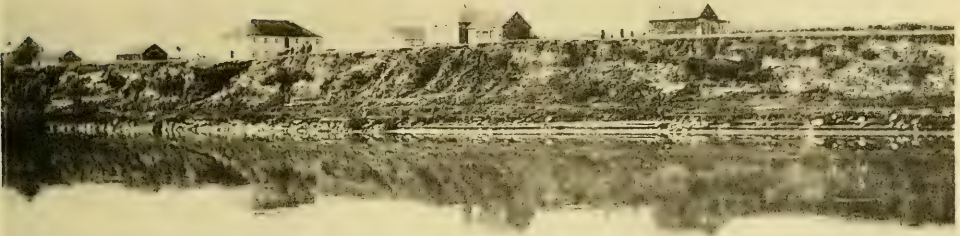
During the winter season communication between the Mackenzie valley and the outside world is maintained by dog sledges or carioles which carry the mails in and out of the valley once a month. Only first-class mail, however, is carried on these.

It may well be understood that to the inhabitants of the Mackenzie valley the great seasonal events of the year are the opening and closing of navigation on the waterways of the basin. The ice of Great Slave lake blocks the navigation of the Mackenzie river for nearly a month after the great river is free of ice. Owing to this fact

A



B



C



FIG. 18. A. SCOW RUNNING THE CHUTES OF PEACE RIVER.

B. SIMPSON, MACKENZIE RIVER.

C. MOUNTAINS AT THE GREAT BEND OF MACKENZIE RIVER.

A



B



C

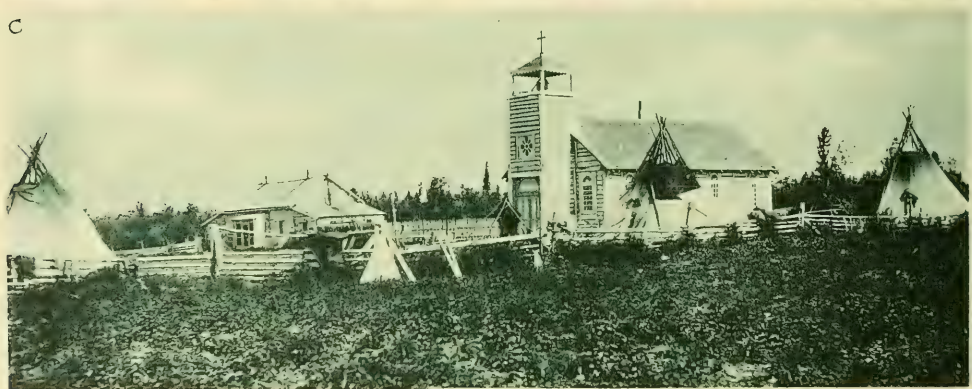


FIG. 19 A. PICKING CUCUMBERS AT SIMPSON.
 B. FLOWER SECTION, EXPERIMENTAL FARM AT VERMILION, PEACE RIVER.
 C. MISSION CHURCH, HAY RIVER, GREAT SLAVE LAKE.

navigation on the Mackenzie is limited to about three and one-half months.

The Mackenzie at Simpson, which is near latitude 62° opens between May 4 and May 20, averaging from the 10th to the 15th, according to Captain Mills, who has spent several years at Simpson and has run steamers on all of the navigable waters of the Mackenzie basin. Because of nearly dead water in the Mackenzie for a long distance, the head of the river opens two-and-a-half or three weeks later than at Simpson. The opening of Great Slave lake generally occurs, according to Captain Mills, between June 16 and July 2, or six weeks later than the Mackenzie below Simpson.

The distance from McMurray, the end of the railway and at the head of navigation on the Athabaska river, to the northernmost trading post reached by the Mackenzie River steamers is 1735 miles. Along these northern reaches of the Mackenzie in midsummer the traveller sees not snow and ice but a large variety of flowers and flower-loving insects (Fig. 11).

The construction of a canal a little more than 20 miles in length around Smith rapids would give uninterrupted water transportation from the end of the railway near McMurray to the Arctic ocean, a distance of about 1750 miles. Such a canal would encounter no serious obstacles west of the present portage route and its construction will probably be one of the steps in the economic development of the great valley.

An extension of the Peace River railway to the head of navigation on Nelson river may eventually become a co-ordinate factor in the northward spread of settlement in the region between Peace river and the Rocky mountains. This would make available for agricultural development the very extensive area lying between Peace river on the east and the Nelson and Liard rivers on the west. The region about the headwaters of the Hay, Black and Nelson rivers is reported to be about half prairie land and is without a doubt one of the most promising large areas in western Canada from the standpoint of agriculture and grazing. A very important function of such a railway would be to give early access to the Mackenzie River basin. The writer has pointed out elsewhere¹ that the construction of a railway from St. Johns to Fort Nelson, a distance of about 175 miles would, owing to the late opening of Great Slave lake, give access to the Mackenzie river more than a month earlier than is now possible.

Steamers leave Fort Smith for the first trip down the Mackenzie about June 24. With them go the winter's accumulation of magazines, paper and other second-class mail, and the annual "permit" or small allowance of liquor which each white man in the remote northern cabins may obtain from the "outside" (Fig. 13). They usually depart from the same point on the second trip about July 26. The navigable waters of the Yukon and Mackenzie basins about the head of the Mackenzie River delta are separated by a portage route of 60 miles. The Hudson's Bay Company once staked out a cart trail over this route and it will probably be bridged by a motor road or tramway eventually.

It is necessary to begin the return trip from Norman not later than September 28th if a winter sojourn is not planned.

No railway or steamboat lines enter the Barren Lands or Arctic Prairies east of the Mackenzie basin. The Hudson Bay railway, when completed, will touch the southeast corner of this vast region. Access to it may be had by various canoe routes. On the Hudson Bay side, Chesterfield inlet and Churchill river, with the lakes and rivers connected with them, furnish waterways by which the voyageur may cross the Arctic Prairies with numerous portages to the Mackenzie basin.

CANOE TRAVEL.—Over a vast area in north-western Canada the traveller has no other choice but the way of the voyageur. Away from the two great trunk streams, on the Yukon and the Mackenzie, the tracking line, the pole, and the paddle, hold their ancient supremacy. On large streams where portages are few and far between there is no more delightful way to travel than by canoe (Fig. 14).

In the northern latitudes where daylight lasts about 24 hours in June, it is feasible for large canoes to travel day and night if the party wishes to speed up. The mosquitoes are less active during the cool nights, which is often another incentive to night travel. The writer has covered the 200 miles stretch between Fort Smith and Resolution by day and night travel in 2½ days. This method for short periods involves no hardship, if the night is divided into two or more watches with only one man at the paddle, while the others sleep or study astronomy from the bottom of the canoe.

The northern rivers disclose only half their charms to the man who knows them only in the bright forenoon and afternoon sunlight. It is after the long delayed sunset that the great, gloomy unexplored spruce forests assume their air of greatest mystery and fascination. The dark-green tops of the tall, slender spruce trees

¹ Kindie, E. M., Arrival and Departure of Winter Conditions in the Mackenzie River Basin: *Geogr. Review*, vol. X, p. 392, Dec., 1920.

are apt to be first outlined sharply against a rose-tinted northwestern sky. This may fade to various tints of purple, green or gray, but not into the darkness of southern latitudes. At midnight there is plenty of light for safe canoeing but not enough to be sure whether a dark object on the bank a few hundred yards away is a moose, a bear or only a black stump. Frequently the canoeman will see in the dim light near the shore a huge finger-like apparition waving furiously in the strong current and pointing downstream as if some river god were pointing the way and admonishing the voyageur not to tarry in his kingdom. An occasional booming splash breaks the midnight stillness as some stately spruce, undercut by the river, drops into the stream with a portion of the bank. If the mass of earth and stones on the roots is large they may anchor it on the river bottom and after the spring break-up of the ice has stripped off its branches it may become one of the weird looking vibrating finger boards. The quiet solemnity of the night is sometimes broken by bird notes.

The approach of sunrise, which in June comes about 2 o'clock on the Slave, brings with it not only a feast of colour for the eye in the north-eastern sky, but a rich blending of odours which at sunset gave no evidence of their existence. In latitude 60° the sun's long winter neglect is atoned for in a way by the magnificence and length of the sunsets. The sunset glow, which in southern latitudes is so quickly blotted out by the blackness of night, lasts here until it slowly merges into rose-hued dawn. The sun is visible all night for about a week in the month of June, on the Porcupine, but during the early part of August the sun drops below the northern horizon about ten o'clock. Till it reappears a little after two in the morning, the whole northern sky is aglow with a glory of colours.

There are only two points on the entire Mackenzie river where the canoeman needs any special advice in regard to avoiding rapids. One of these is opposite the site of old Fort Wrigley. Here the river splits on a rocky island. Loaded canoes and scows should take the west channel. The narrow eastern channel is rather swift water. The other locality is the Sans Sault rapids. Here also the canoeman should take the west side of the river, keeping near the shore. The Vermilion chutes (Fig. 18) on the Peace river and the Smith rapids on the Slave are always portaged. On the Yukon the canoeman can travel from Whitehorse to the sea, a distance of 2,000 miles, without taking his canoe out of the water.

The maze of lakes and their connecting streams

make it possible to cross from one watershed to another and to reach nearly any part of northern Canada by means of canoes. But away from such great trunk streams as the Peace or Mackenzie, rapids, falls and portages are numerous and "tracking" and "poling" become very essential features of canoeing. Most of the smaller rivers can be traversed only with the aid of Indian or other skilled canoemen.

In the rapids and swift waters which characterize most tributaries of the Mackenzie and the rivers of the Arctic Prairies the expert canoeman who likes the red-blooded sport of running white water will find unlimited opportunities to enjoy this exciting game. In some of these streams small but troublesome rapids occur widely and irregularly spaced where the voyageur must frequently take to the water and "frog" his canoe through the menacing boulders. In the case of one northwestern river familiar to the writer, the Indians consider the rapids to represent the footsteps of an evil spirit who once traversed the stream. Such stretches of strenuous water lead the canoeman, who must laboriously pole or line his canoe upstream through them, to hurl a variety of evil maledictions at the threatening ledges and ragged boulders gleaming through the yellowish-white water. Generally the boulder teeth of the rapids retaliate with nothing worse than an occasional slash through the canvas cover of the canoe.

FORESTS.—Dense forests border the Yukon and Mackenzie rivers and their tributary streams throughout their length (Fig. 17). These forests usually consist of trees which seldom exceed a foot in diameter, although occasional trees may reach twice this size. The heavily wooded character of the banks of the rivers, together with the muskegs, make travel inland from the rivers extremely slow and difficult where no trails exist. The more common trees are the black pine (*Pinus murrayana*), the white spruce (*Picea alba*), and the smooth and rough barked poplars (*Populus tremuloides* and *P. balsamifera*). Jackpine, larch, willow and alder are also frequently seen.

The steamboats depend entirely upon the river-side forests for fuel. Lumber for local use is cut by small saw mills in the Mackenzie basin located at Grand Detour and Fitzgerald. An abundance of timber large enough for building cabins and other local uses is found along the Mackenzie as far north as the delta and also along many of the smaller rivers to the east of the Mackenzie valley.

During seasons of unusually high water a great deal of driftwood is carried to the sea by the Yukon and Mackenzie rivers. Most of the

driftwood from these and other rivers eventually lands on the coasts of Alaska and Canada, where vast quantities of forest debris, consisting largely of good-sized logs and trees, are piled up on the beach adjacent to land which affords nothing in the shape of timber larger than the Arctic willow, which seldom grows higher than a man's head. When floating trees are not too numerous the voyageur sometimes utilizes one of the larger trees which still retains the branches to make progress against an up-river wind. The deeply submerged branches cause the strong subsurface current to bear such a tree and any canoe which may be attached to it into the teeth of an up-river breeze as effectively as the under-water sail expedient, which is often resorted to when a floating tree is not available. Even in fair weather the floating tree is often made use of to save time for the voyageur on the Mackenzie. By lashing to a suitable tree he can cook his meals while proceeding on his way. If for any reason night travel seems desirable, the canoe may be secured to an Arctic-bound tree at bedtime and an undisturbed sleep obtained.

The driftwood from the Slave and Peace rivers generally ends its northward journey on the shores of Great Slave lake (Fig. 21) so that the driftwood on the Mackenzie is derived chiefly from its tributaries north of this lake. The Gravel, the Peel, and other large western tributaries of the Mackenzie doubtless carry quantities of driftwood into the main stream, but the great bulk comes from the Liard river. The timber growing on the banks of the Liard and its southern branches is about as large as that found on the Peace and Slave rivers, and its driftwood includes many trees from one to two feet in diameter. The unusually high stage which the Liard reached in 1919 set afloat a vast quantity of stranded logs, many of which had started their northern journey in previous years. At the time the mouth of the Liard was passed on July 1, it was discharging very little driftwood. The vanguard of the main volume of the Liard driftwood reached Old Fort Good Hope on the lower Mackenzie about July 13. At that time the writer was using a canoe a short distance above the old fort and had an opportunity to get a clear conception of the great volume of the floating mass of trees, logs, limbs and bark. This floating mass of travel-scarred tree trunks and forest debris greatly exceeded in volume anything previously seen or imagined. In general it formed a nearly continuous mass a quarter of a mile or more in width. When, as frequently happened, the mass of drift spread out under the influence of a breeze or current which carried it toward the middle of

the river the width often exceeded a mile. Walking over this driftwood was often more feasible than canoeing through it. The closely packed phase of this particular exodus occupied about four days in passing a given point. Detached masses of small size and single, widely scattered logs followed it for several days. Spruce and poplar comprise the great bulk of the Mackenzie driftwood. Here indeed is a mammoth supply of pulpwood delivered at tidewater, cutting and transportation free, that merits the consideration of any enterprising paper company which can solve the commercial problem of transportation around the Alaskan coast.

VEGETATION AND AGRICULTURE.—All traces of winter conditions have disappeared from the Mackenzie valley by the time the first steamer is able to get through Great Slave lake to the head of the river, which is usually early in July. Concerning the climate of early summer, Keele, who wintered near the head of Gravel river in lat. $63^{\circ} 30'$, remarks that "June is a perfect summer month with practically no darkness and on fair days nearly twenty hours of bright sunshine; the temperature sometimes reaches as high as 90° .¹

The nearly continuous sunshine of June is the great factor in the rapid development of vegetation. "Compared with Ottawa, Simpson has an average of three hours more sunlight daily for the summer months, which means about eighteen days of additional sunlight during the three months when sunshine is most important"² (Figs. 19 and 20).

A traveller in the Mackenzie valley who sees for the first time the limestone scarps and cliffs of the Mackenzie mountains so near the Arctic zone entirely free of snow in midsummer, is apt to be surprised when he recalls the glaciers and permanent snow fields which are familiar features of the same mountains many hundred of miles farther south (Fig. 18c). The Nahanni mountains of the Mackenzie valley, which are quite free of snow in July, are in about the same latitude as the mouth of Frobisher bay, Baffin land, where the writer has seen a ship stuck for days in the ice flows and experienced a snow storm late in July. The warm genial summer climate of the Mackenzie valley cannot fail to impress anyone who is familiar with the bleak coasts of north-eastern America which lie in the same latitude. Although the middle portion of the Mackenzie

¹ Keele, Joseph. A Reconnaissance Across the Mackenzie Mountains on the Pelly, Ross and Gravel Rivers, Yukon and Northwest Territories, Geol. Surv., Dept. of Mines, Ottawa, p. 22, No. 1097.

² Cammell, Chas., and Malcolm, Wyatt: The Mackenzie River Basin, Geol. Surv. Can., Memoir 108, Geol. Ser. No. 92, p. 43, 1919.

valley lies in about the same latitude as Baffin land, its summer climate bears a much stronger resemblance to that of Gaspé peninsula south of the Gulf of St. Lawrence than it does to the Baffin land summer. Dr. Camsell, who has a more intimate knowledge of the climate of the Mackenzie valley as a whole than anyone else who has written on the subject, states that "in general it may be said that any point in the Mackenzie basin has a milder climate than any corresponding point of the same latitude in northern Manitoba, Ontario, or Quebec".¹ The relatively warm summer climate of the Mackenzie valley may be ascribed chiefly to its remoteness from the chilling influence of Hudson bay and to its low average elevation. Most of this great lowland is less than 500 feet above sea level, while much of the northern half of Alberta immediately south of it lies at an elevation of 2,000 feet or more. Warm air currents from the Pacific may also be a factor (Fig. 22).

Many varieties of flowers in bloom crowd the fire-cleared spaces of the lowland and the mountain slopes early in July. Among these, orchids occur locally in abundance. Ripe red raspberries were seen on August 7 at Bear mountain, which is about 80 miles south of the Arctic Circle. Blueberries were a feature of the writer's camp fare from the first week in August to the end of the summer.

In the vicinity of the Mackenzie delta perpetual frost reaches so near the surface in summer as to make the raising of any save the hardiest vegetables impracticable. In the Yukon valley at Fort Yukon, located just at the Arctic Circle, and at Good Hope on Mackenzie river, a short distance south of the Circle the writer has seen fine-looking gardens in which potatoes were the most conspicuous vegetables. An old government statistical report states that at Fort Yukon, lat. 66° 37', barley and other cereals are grown. Old Russian records give 59.7° as the mean for June, July and August at Fort Yukon.

The gardens, kept by agents of the trading companies, which may be seen at intervals of 150 to 200 miles along the Mackenzie, show that excellent crops of all the more hardy garden vegetables may be grown in favourable seasons as far north as the Arctic Circle. Potatoes which the writer selected from a field at Simpson weighed in two or three cases a few ounces over a pound each. A turnip—the largest of a lot purchased for camp use from an Indian garden at Simpson—had a length of nine inches and a diameter of five inches, the long tap root not being included in these figures. The

largest turnip ever seen by the writer was grown near the shore of Great Slave lake. Oats and barley are raised at Simpson, lat. 61° 50' and wheat sometimes succeeds there. A few cattle are kept there on the government farm, wild hay being used for feed. August or July frosts are not unknown, but in favourable seasons the crops compare well with those raised in southern Canada.

Thawing in the southern part of the Mackenzie valley proceeds downward a few feet below the surface in summer. Mr. Harris, who is in charge of the government farm at Simpson, states that his well entered frozen ground at a depth of about 5 feet and passed out of frost at about 40 feet. A frost limit of 40 feet is in sharp contrast with the conditions prevailing in the Yukon valley and the Nome district in Alaska. Near Nome a shaft 120 feet deep did not penetrate below perpetual frost. Cleveland Abbe states that "there is only one instance on record where excavation in this northwestern region has gone below the zone of perpetual frost".¹ This is a Klondike shaft which passed through the frost zone into flowing water at about 220 feet.²

The relatively moderate depth of frost penetration in the upper Mackenzie valley as compared with the lower limit of frost in the Klondike and much of northern Alaska clearly indicates a climate more favourable to agriculture in the former region.

Old Hudson's Bay records show that on the Upper Liard river wheat, barley, rye, oats, Indian corn, potatoes, turnips and other vegetables put in the ground at Fort Halkett, lat 59° 30', towards the end of May, are generally mature towards the end of August. Flowers blossom the first week in May. Wheat is a sure crop four years out of five. The climate is similar to that of Manitoba, but improved by Chinook winds. Frost penetrates the ground about four feet. River freezes over about the middle of October.³

At Fort Vermilion (Fig. 19) on Peace river near lat. 58° 30', the writer was told by the Superintendent of the Government Experimental Farm that wheat had failed to mature in but three years out of twenty-seven. Experiments are in progress there in growing a number of fruit trees and shrubs as well as with the grains commonly grown in northern climates. Wheat and oats are

¹ Brooks, A. H.: The Geography and Geology of Alaska. A Summary of Existing Knowledge; with a Section on Climate by Cleveland Abbe, Jr.: U.S.G.S. Prof. Paper, No. 45, Washington, D.C., p. 147, 1906.

² Tyrrell, J. B.: A Peculiar Artesian Well in the Klondike: *Engineering and Mining Journal*, vol. 75, p. 188, 1903.

³ Baillairge, G. F.: Canada from the Atlantic to the Pacific and Arctic Oceans, Arctic Voyages, Voyages of Discovery in the North and Public Works, etc., etc., p. 127, 1889.

¹ Camsell, Chas., and Malcolm, Wyatt.: *Op. cit.*, p. 43.

A



B



C



FIG. 20. DOMINION EXPERIMENTAL FARM AT BEAVERLODGE, ALBERTA,
NEAR LATITUDE 56.

A. PLOTS OF WHEAT AND OATS.

B. AN INSPECTING PARTY AT THE FARM.

C. PLOTS OF CLOVER.

I staid in the country [six years] The soil is fertile and the climate temperate, fit for the produce of all kinds of grain and for raising flocks of tame cattle: and the coast abounds with black and white whales, seals, sea-horses and various kinds of small fish."

GRAZING.—In the Yukon basin the mountainous character of the country precludes any commercial development of either grazing or agriculture. But even there the long nightless days will make the valleys produce grain as well as gold if the miner cares to become a farmer. The photograph (Fig. 10) shows grain grown on one of the famous gold creeks.

The Mackenzie basin, including the high tablelands cut by the Peace and Athabaska rivers, has however, a promising future in this field if we can judge from geographic analogies. On the western plains of southern Canada and the northern States the sequence of events connected with their settlement has been (a) the disappearance of the buffalo, (b) the coming of the cattleman, (c) the coming of the farmer. The buffalo has vanished from all of its old range in Canada except a block of territory south of the western third of Great Slave lake, where a considerable number still thrive under government protection. But neither the cattleman nor the farmer has taken over the vast grazing territory between the Rocky mountains and the Slave and lower Peace rivers. If the wild buffalo still living between the parallels of 59° and 61° west of Slave river is not sufficient evidence that cattle will thrive in these latitudes, and live during much of the year on the range, the fine herd of cattle kept by the Roman Catholic Brothers in the Salt River valley 18 miles west of Fort Smith should be. The name of the principal stream in this region—Hay river—should also encourage the cattleman to try out the possibilities of the region. At Simpson near latitude 62° a few cattle are kept and oxen are used for ploughing. There is no reason, so far as luxuriant pasture is concerned, why cattle should not be raised in the Mackenzie valley as far north as the Arctic Circle and even beyond. The reason they are not generally kept at the posts is that the small number of white men in the Slave and Mackenzie valleys are fully engaged in handling the annual \$2,000,000 catch of furs.

Stretching eastward from the timbered lands and mountains of the Mackenzie basin to Hudson bay is the most extensive grazing region in North America. It includes most of the Canadian Shield west of Hudson bay north of 56° (Map, Fig. 22). It is a prairie region which owing to the absence of timber was long ago labelled with the name "Barren Lands" which has stuck to it

in spite of such descriptions as that of E. A. Preble, the naturalist, who states that "thousands of lakes dot its surface, and they are often bordered by grassy plains and gentle slopes, on which during the short summer, the bright flowers of a profusion of shrubs and herbaceous plants lend their beauty to the landscape, and prove the appellation 'Barren Grounds' to be a misnomer." Barren Lands, the name by which this vast region is best known, leads one to expect a description of it to read something like Washington Irving's account of a part of the State of Idaho, "where nothing meets the eye but desolate and awful waste; where no grass grows nor water runs, and where nothing is to be seen but lava"¹. It is therefore a genuine surprise to hear Ernest Thompson Seton's account of it. "And what a region it is for pasture. At this place it reminds one of Texas. Open, grassy plains, sparser reaches of sand, long slopes of mesquite, mesas dotted with cedars and stretches of chaparral and soapweed. Only, those vegetations here are willow, dwarf birch, and ledum, and the country as a whole is far too green and rich. The emerald verdure of the shore, in not a few places, carries me back to the west coast of Ireland"². Tyrrell, who collected in this region, which he calls the Treeless Plains, 124 flowering plants, characterizes it as "a vast undulating plain, underlain by a stony clay, and covered with short grass or deciduous Arctic plants. In certain sections no rising ground can be seen for miles around, and in other sections rocky hills rise throughout the general covering of clay. The whole land reminds one forcibly of the great plains of western Canada, the chief points of difference being caused by the difference in the underlying rocky floor"³. The Arctic Prairies have been estimated to have an area of more than 400,000 square miles, or more than three times the size of Great Britain, and to be the home of more than 30,000,000 caribou. Surely as a name for such a country, "Barren Lands" should give way to Arctic Prairies, the Great Lone Land, or better still the Caribou Plains.

The population of this great empty land is limited to a few small bands of Eskimo who are confined to the coast and lake region west of Hudson bay and the Arctic coast. The natives depend chiefly on the caribou for clothing (Fig. 24).

Whatever may be the total number of caribou ranging over this vast region, all observers of the

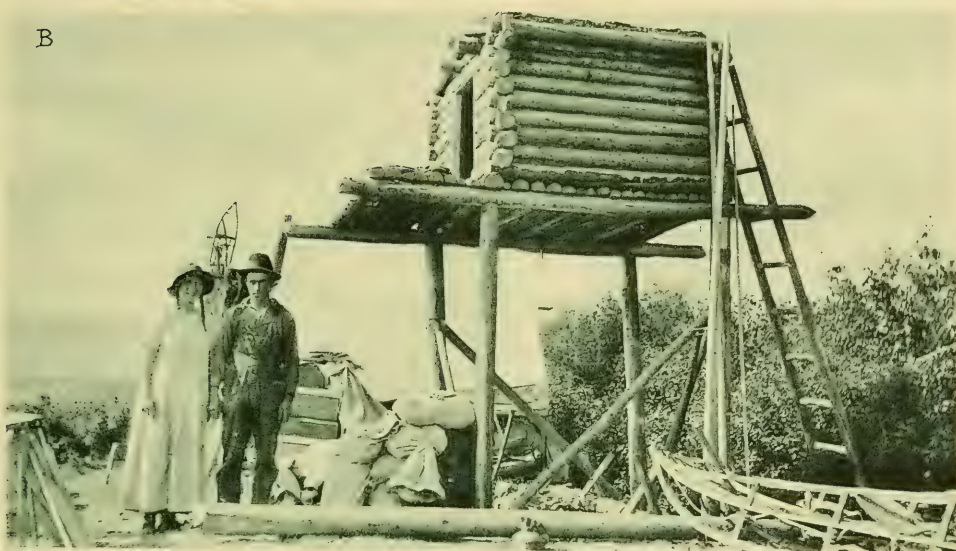
¹ The Adventures of Captain Bonneville, U.S.A., New York, p. 203, 1868.

² Seton, Ernest Thompson: The Arctic Prairies (London), p. 222, 1920.

³ Tyrrell, J. B.: Nat. Resources of the Barren Lands of Canada: *Scottish Geog. Magazine*, Vol. XV, p. 128, 1899.



B



C



FIG. 23. A. A NORTHERN DOG.

B. A PROVISION CACHE AT NORMAN, USED TO PROTECT FOOD SUPPLIES FROM DOGS.

C. THE ARCTIC PRAIRIES (BARREN LANDS), EAST OF GREAT SLAVE LAKE, IN AUTUMN.



FIG. 25. REINDEER, AND HALF-BREED ESKIMO GIRLS AT CAPE PRINCE OF WALES, ALASKA.

annual migrations agree that these animals appear at times in enormous numbers. During the summer of 1893, while travelling northward between Athabaska lake and Chesterfield inlet, the Tyrrell brothers¹ saw on the shores of Carey lake, about latitude 62° 15', a herd estimated to

Warburton Pike saw enormous numbers at Mackay lake, October 20, 1899, and says: "I cannot believe that the herds of buffalo on the prairie ever surpassed in size *La Foule* (the throng) of the caribou. *La Foule* had really come and during its passage of six days I was



Fig. 24

contain 100,000 to 200,000 individuals. It was reported that in 1877 caribou crossed the north arm of Great Slave lake on the ice in an unbroken line which was fourteen days in passing, and in such a mass, that in the words of an eye witness, "daylight could not be seen" through the column.²

¹ Canadian Geological Survey, Annual Report, vol. IX p. 165, 1898.

² Frank Russel: Explorations in the Far North, p. 88, 1898.

able to realize what an extraordinary number of these animals still roam the Barren Grounds". In 1917 Inspector K. F. Anderson of the R.N.W. M.P. then stationed at Fitzgerald, Slave river, wrote³ that "the caribou are within 35 miles of this place (east) in tens of thousands and the natives are getting numbers of the animals and will therefore have plenty to eat this winter."

³ Letter to E. M. Kindle, December 15, 1917.

The great value of the caribou to the Indians and Eskimo who live on or near the borders of the Arctic Prairies can scarcely be overestimated (Fig. 25). Their presence will make relatively easy the work of the prospector and others in this region who will in the future find it desirable to "live off the country", in part at least.

There can be no doubt that domestic reindeer can be raised in the Arctic Prairies as successfully as in Alaska, where the herds doubled their numbers in two and one-third years. When the introduction of domestic reindeer into this region is undertaken the assistance of Lapp or other experienced herders will be required for some years. The rules and regulations summarized by C. Gordon Hewitt¹ which have put reindeer raising on a commercial basis in Alaska may well be carefully studied in this connection. The raising of reindeer and the shipment of the meat to eastern cities should eventually become an industry of importance not only in the "Barren Lands" but in other lands about the northern half of Hudson bay and the Arctic islands.

The economic value of the reindeer has been very clearly stated by Dr. Grenfell. He says²: "Few other animals on the earth's surface offer as much to man with so little outlay. With scarcely any aid, races of men can subsist on what these beasts alone can provide. For transport they have been shown, under right circumstances, to be able to compete with the Eskimo dog in speed and endurance. On the Alaskan tundra, where the snowfall is much like that of Labrador, they have been an unqualified success. On journeys they can find their own food by the way—an item most important, for the dogs are obliged to carry this additional, and by no means inconsiderable, burden with them. Reindeer are now used not only for packing over open land uncovered with snow in summertime, when dogs are entirely useless, but they are in regular use for running the United States mail service in the depth of an Arctic winter. Geldings are said to be far more readily trained to harness than stags, and are easier to keep in good physical condition. At a pinch, one's steeds may be killed and eaten with relish, while the carcass, where meat supplies are scarce, is always of incomparable value. The tongues and kidneys form great delicacies, and the tongues may be smoked for export. A good-sized stag will weigh three hundred pounds. The large, thickly-haired skin of caribou or of the Lapland reindeer is invaluable for many pur-

poses—for boots, clothing, sleeping-bags, tent and blankets. These skins need scarcely any preparatory treatment. Dehaired and dressed, they make most satisfactory clothing for use in cold climates. The sleek, dark-brown hair of the early fall affords a very beautiful material for ladies' jackets or motor coats, and picked skins for such purposes should well repay exportation; two dollars apiece is the present local price for Labrador deer skins. Some of our deer have snow-white skins in winter, and the hair is as thick as a coconut fibre mat.

Moccasins manufactured from the thinner deer skins make the warmest foot-gear known. The heavier stag skins furnish admirable light, soft, flexible over-clothes. They are perfectly wind-proof, and, when dressed for use, fetch fifty cents to one dollar per pound weight. Stretched, undressed, they are sold by the pound as parchment; this, cut into strips, is rolled up, and sold as *babêche* out of which all the fillings for snowshoes are made. Of this, also, are made the lashings for our sledges and the harness for our dogs. The tough thongs show remarkable elastic strength as they 'feel' the jarring and jolting of the rough trails. The very tendons that are useless as food are amongst our most valuable acquisitions, affording our women all the sewing material they need for making boots, skin-boats (or kayaks), and clothing. These animal tendons are taken and dried, and fetch from ten to fifty cents for each animal. They strip easily into single fibres, and these separate threads form a strong sewing material, which resists water, and yet, when used in boots intended to be water-tight, swells up as soon as the boots are immersed in moisture. In this way leakage through the needle holes is prevented. The tendons do not rot easily, nor do they tear the skin substances, for they contract and expand with that material. Even the horns and hoofs are valuable, and furnish many of the household essentials of the natives. [Some of these various manufactured products can be exported to the European markets. Reindeer may thus largely increase the earning capacity of any region, by converting its unsaleable material into valuable products. The fresh rich milk of the does in the summer has also supplied us with what is a vital necessity, and one which was obtainable in Labrador in no other way; while the excellent and easily made cheeses afford a method of storing the nutriment in a palatable and assimilable form without any necessary outlay for a preserving plant.]"

The musk-ox occupies the northern half of the Arctic Prairies conjointly with the caribou. It is present in no such numbers as the deer, how-

¹ Hewitt, C. Gordon: Conservation of the Wild Life of Canada, Chas. Scribner's Sons, p. 321, 1921.

² Grenfell, Wilfred T. and others: Labrador, the Country and the People (Reindeer for Labrador), 1909.

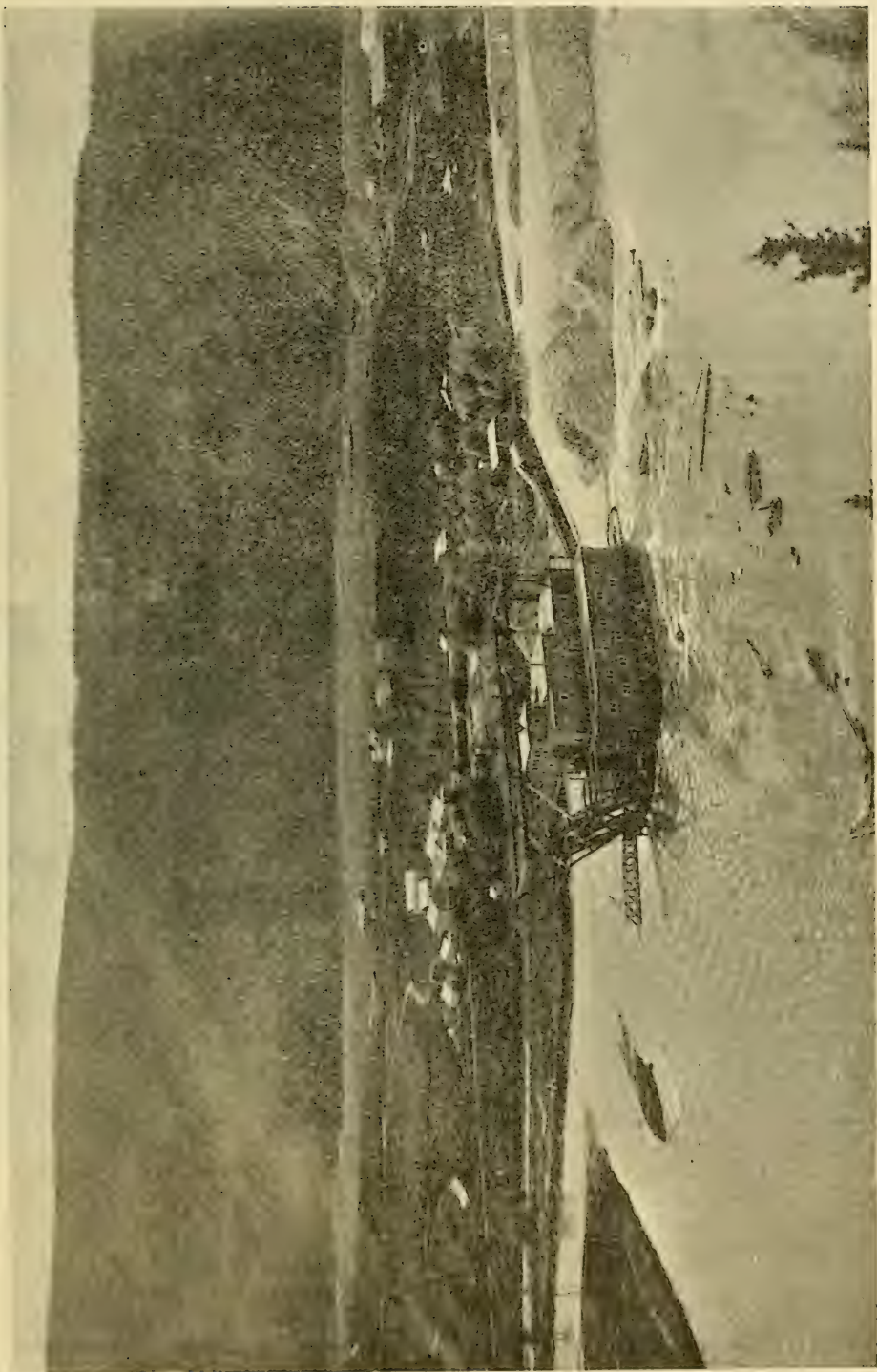


Fig. 26

ever, and appears to be in danger of extinction. The excellence of musk-ox meat and the possibility of utilizing its wool led Professor S. F. Baird to suggest as long ago as 1854 the domestication of the animal. Mr. Stefansson has strongly urged the importance of this, and states that the musk-ox furnishes twice as much meat and fat and three times as much milk as a reindeer. Whether the vicious disposition which, according to Dr. Hornaday¹, characterized the individuals kept for some years in captivity in New York is general and serious enough to prevent domestication can best be tested by experiments within or near the natural ranges of the musk-ox.

The writer's personal knowledge of the west coast of Hudson bay is limited to the region about the southern and western sides of James bay, which, though entirely unoccupied by settlers, is south of the limits set for the present discussion. It may be noted, however, before citing the evidence of others more familiar with the northerly reaches of this coast-line, that parts of the zone of prairie and marsh land bordering the sea-coast, which is generally from 2 to 5 miles wide, may eventually be utilized as a grazing belt. It grows enormous quantities of wild hay and is reported to extend without break from Moose Factory to Churchill and beyond for an unknown distance. It is improbable that it will long remain unoccupied after the railroad to Moose Factory and the Hudson Bay Railway are completed. This coastal zone of prairie and marsh (where the writer knows it) is not, as stated by one author, identical in soil with the "Clay belt" of Ontario, but consists chiefly of marine clay and has greater agricultural possibilities than the glacial till soils of the "Clay belt". It is at present the greatest breeding ground for water-fowl in Canada.

Concerning the game of this zone north of Port Nelson, Nap. A. Comeau has written as follows: "I have visited and shot over most of the celebrated game resorts of this continent, the North-western States with its famed duck ponds, Lake Champlain in its palmy days, the famous Longue Point and Sorel marshes, seal reef in the St. Lawrence and the Labrador shore with its myriads of birds; but never have I seen anything that could compare to this Hudson Bay shore. Geese of various kinds, black and pintail ducks, many species of plovers and the smaller members of this family, are to be found there in countless thousands. All that low marshy belt of land extending from Churchill to James bay, several hundred miles in length and eight to ten wide, on

an average, is nothing but an immense breeding ground."¹

MINERAL RESOURCES.—Canada began to realize the previously unsuspected value of her northern mineral resources in 1896, when the production of gold in the Yukon district leaped from a value of three hundred thousand to two and a half million dollars in a single year. A year later the gold output of the Yukon country had increased to ten million dollars. The wealth of the Klondike river permanently dissipated the scepticism which once reigned concerning the potential value of Canada's mineral resources in high latitudes. The work of the Canadian Geological Survey has assembled a very large amount of detailed information concerning these resources, many of which remain undeveloped chiefly because of the vast distances involved and the entire absence of population in many of the areas in which they occur. In the space here available only the briefest mention of some of these resources is possible.

It may be pointed out, however, that the solution of the problem of placing certain of our railways on a paying basis depends more completely on the development of our mineral resources than on the growth of any other industry. This fact is well illustrated by the financial record of the White Pass and Yukon Railway, the most northerly railway in Canada, which was built soon after the discovery of the Klondike. The net earnings of this road during the first year of its operation were reported as \$30,000 a mile, and for the fiscal year ending in 1902 as 61 per cent of the capital stock.

Copper, because of its coloured salts, is much more easily recognized than either gold or silver. It has been found at various points in the Northwest. Tyrrell has reported it from the northwest side of Hudson bay between Bakers Foreland and Cape Eskimo in Keewatin greenstone. J. M. Bell speaks of numerous stringers of calc spar containing chalcopyrite east of McTavish bay, Great Slave lake. On the White and Copper rivers near the Yukon-Alaska boundary native copper occurs loose in the gravel of the river bed. Undoubtedly the largest area of copper mineralization in Canada is that extending along the Arctic coast from the Coppermine river eastward to Bathurst inlet.

The existence of these extensive deposits of native copper has been known for more than a hundred years. A recently published report on them gives some important information concern-

¹ Dept. of the Naval Service: Reports on Fisheries Investigations in Hudson and James Bays and Tributary Waters in 1914, pp. 77, 78, 1915.

A



B

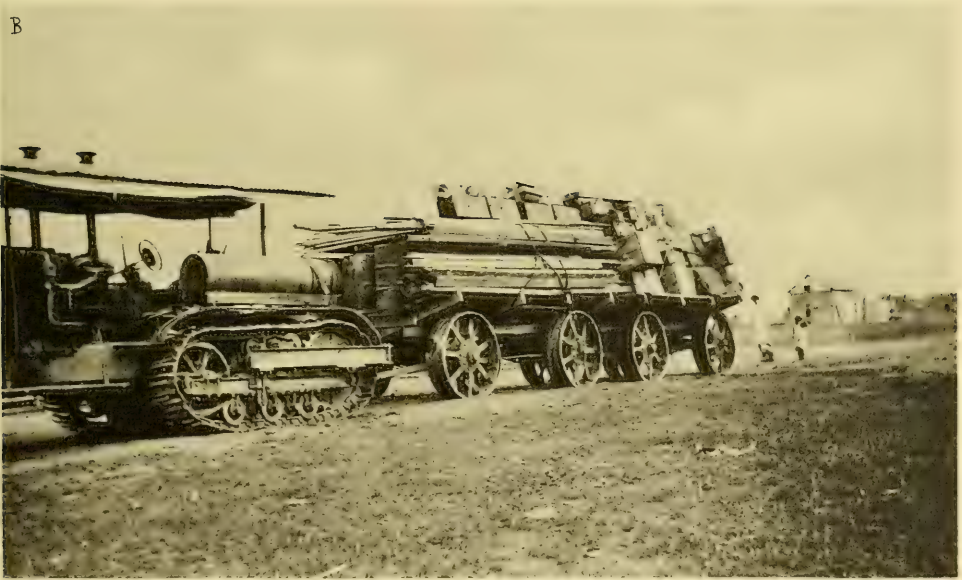


FIG. 27. THE OLD AND NEW METHODS OF TRANSPORT IN THE NORTH.
A. FIRST AIRPLANE TO REACH MACKENZIE RIVER, IN 1921. PHOTOGRAPHED
AT PROVIDENCE BY MR. KITSON.
B. CATERPILLAR TRACTOR PORTAGING AROUND SMITH RAPIDS, SLAVE
RIVER.

A



B



C



FIG. 28. A. ALEXANDRA FALLS, HAY RIVER, HEIGHT 105 FEET.

B. RAMPARTS OF MACKENZIE RIVER.

C. FALLS $1\frac{1}{2}$ MILES BELOW ALEXANDRA FALLS.

ing the extent of Canada's resources in the North. Professor O'Neill states, with reference to the Bathurst Inlet area (See Map, Fig. 2) on the Arctic coast, that "native copper was seen on almost every island in the area as well as on the mainland. The distribution of the metal is remarkably uniform throughout any single flow. A rock section over 450 feet thick, on Banks peninsula, showed copper through about 350 feet of the total thickness. *Disseminated copper occurs over the whole area of more than 1,000 square miles and practically through the whole exposed thickness of the formation.* In addition to native copper, sulphides of copper occur in the district and appear to be worthy of investigation. The possibility should not be forgotten that, in the Coppermine River region, important deposits of sulphides may also occur in the limestones or dolomites, which are there found below the amygdaloids. Some of the thin dolomite layers are completely replaced for several feet along the strike and others have masses of the sulphides scattered through them. The determination of the sulphide content with reasonable degree of accuracy would at least involve drilling. The sulphides of one layer, 6 inches in thickness, were examined by H. E. Ellsworth, and determined to be a mixture of 79 per cent chalcocite and 21 per cent covellite, and on analysis the material proved to contain 49.87 per cent copper. Assuming that one cubic yard of rock weighs 1 ton and that 90 feet is the average thickness of copper-bearing rock, the available tonnage would be about 6,000,000,000 tons carrying 1/100 to 1/4 of one per cent of disseminated native copper; and an unestimated amount of amygdaloidal material, which assays over one per cent of copper; as well as the copper of the veins, some of which are filled with thin sheets of native copper and others carry over 4½ per cent of flake copper."¹

Concerning the Coppermine River district O'Neill writes as follows: "It is also certain that the matrix of some of the conglomerates has been replaced by native copper, and a specimen obtained of this is very rich. It is also known that numerous large masses of copper occur in the drift immediately north of the copper-bearing rocks west of Coppermine river; so that it seems highly probable that parts of this district contain workable and even rich deposits. The district is easily reached from Great Bear lake and transportation could be arranged via the Mackenzie River valley."²

The transportation problem which must be solved when these copper deposits are developed is discussed under the head of Oceanography and Marine Transportation.

The presence of oil in the Mackenzie River valley has long been known, but the remoteness of the region from markets has delayed until recently any attempt to develop it. The tar springs of the Athabaska region were noted as early as 1789 by Sir Alexander Mackenzie in the *Voyages through North America to the Frozen and Pacific Oceans*. The first report of the Canadian Geological Survey on the Mackenzie River valley by McConnell published in 1890 describes the oil prospects of the region. His report states that "the Devonian rocks throughout the Mackenzie valley are nearly everywhere more or less petroliferous, and over large areas afford promising indications of the presence of oil in workable quantities. The rock is in several places around the western arm of Great Slave lake highly charged with bituminous matter and on the north shore tar exudes from the surface and forms springs and pools at several points."³ Nearly every geologist who has since visited the region has commented on the oil seepages found in certain areas. The discovery of oil in the Mackenzie valley is therefore not a new thing.

The first attempt to exploit this oil was made during the summer of 1920 by the Imperial Oil Company. At 783 feet a strong flow of oil was struck. For ten minutes a column of oil spouted from the 6-inch casing to a height of 75 feet above the derrick floor, after which the well was capped. The flow on that occasion probably exceeded 600 barrels of oil. On two subsequent occasions the valve was opened, with similar results. This well was eventually deepened to 951 feet and another flow of oil struck amounting to 60 or 70 barrels per day. The transportation problem has prevented the development of Mackenzie Valley oil beyond this demonstration of its existence in what would be good commercial quantities further south.

Natural gas was encountered while drilling for oil north of Norman and used for heating purposes by the drillers throughout one winter. The presence of a gas field on the Athabaska river was demonstrated several years ago by the Pelican well which remained for a long period uncapped because of the high pressure and volume of the gas flow. Utilization of the gas of the Mackenzie basin must await with the oil the growth of population northward or the

¹ O'Neill, J. J.: Canadian Arctic Expedition, 1913-1918, vol. XI, Geology and Geography, pp. 51A-62A, 1924.

² O'Neill, J. J.: *Op. cit.*, p. 71A.

³ McConnell, R. G.: On Exploration in the Yukon and Mackenzie Basins, N.W.T., Can., Can. Geol. Surv. Ann. Rept. N.S. vol. IV, pt. D, page 31, 1888-89 (1890).

development of a means of marketing which will solve the problem of transportation to centres of population.

The occurrence of hematite iron ore in the Mackenzie valley has been reported at two widely separated points by Keele¹ and the author.² It is important to note that this area is not very remote from a deposit of coal in the form of lignite which occurs near Norman in a bed about 5 feet thick. This coal was discovered by Mackenzie more than a hundred years ago, at the time of his journey down the great river. Ignited through some unknown agency it was burning then and was still burning when seen by the writer in 1919. Coal has been reported on the Liard river, on the north shore of Great Bear lake and elsewhere in the north.

The salt used in the Mackenzie valley has been supplied since the earliest days of the fur trade by the natural deposits on the Salt river west of Fort Smith and other similar localities on the Athabaska river where brine springs produce considerable annual deposits of salt.

The problem of utilizing the rich asphaltum deposits of the bituminous sands which border the Athabaska river for more than a hundred miles is one of the many problems of economic geology in the North still awaiting solution. The bituminous sand is a soft, porous sandstone saturated with a thick black oil resembling and smelling like asphaltum. On a warm day much of this material easily moulds into balls in the hands. It has been utilized to a limited extent in road building.

Too little is known of the Precambrian Shield (Fig. 22) south of the coastal strip along the Arctic sea to say anything of its mineral resources except to point out that the formations which have furnished the rich silver and nickel ores of Ontario are likely to be found in this region. J. B. Tyrrell, who traversed and mapped parts of this region some years ago for the Canadian Geological Survey, has expressed his confidence in the future development of mining in the Barren Lands as follows:³ "That these belts of Huronian rocks will eventually prove of great economic importance, there can be no doubt whatever. In Ontario the wonderful general richness of these rocks is just beginning to be recognized, but from them were taken in 1896 gold to the value of \$121,000, nickel to the value of \$1,189,000,

and copper to the value of \$320,000; while in the states adjoining Lake Superior the total production of iron ore in 1895 from these rocks was 10,269,000 long tons, valued at about \$20,000,000. This was 62.31 per cent of the total amount of iron produced in the whole United States." The confidence thus expressed by Tyrrell a quarter of a century ago, in the future great developments to be expected in the Huronian rocks of the northern parts of the Canadian Shield, has been amply justified by the discoveries of recent years in the rocks south and southeast of the Barren Lands. The story of the discovery of the Flin Flon area in Manitoba with its gold, copper, and zinc deposits; of the Red Lake mines in northern Ontario, and of the Rouyn district in Quebec reads like a fairy tale. Even during the year 1927 when no spectacular mining discoveries were made in Canada, the total value of the mineral production was \$241,773,000—a gain of one and one-third million dollars over the previous year's record.

WATERPOWER.—In the vast area of the Canadian Shield (Fig. 22) where important mining developments may be expected in the future, coal is absent but an abundance of hydro-electric power is available. The Nelson river affords a conspicuous example of unused power. According to the late Dr. Wm. McInnes¹ the Nelson river has a descent of about 240 feet between Winnipeg and Split lakes. The current between the numerous lake expansions is generally swift, and upwards of a dozen falls and rapids occur, some of the former offering magnificent sites for waterpowers. The aggregate power that could be generated along the river is enormous, as the amount of water passing over the various falls is very great. The volume of the river can be appreciated by a consideration of the extent of its drainage area, which embraces all the country westward to the mountains between the watershed of the Churchill and Athabaska on the north, and the Missouri on the south, and eastward to the head waters of Albany river, and within fifty miles of Lake Superior.

The basin of Great Slave lake is a region which possesses a large amount of potential waterpower. The great Precambrian Plateau rises about 700 feet above the eastern end of Great Slave lake. The Lockhart river descends from this plateau to the lake in a series of rapids and falls, its discharge being more than 20,000 cubic feet per second.² G. H. Blanchet estimates the highest

¹ Keele, Jos.: *A Reconnaissance Across the Mackenzie Mountains on the Pelly, Ross and Gravel Rivers, Yukon and Northwest Territories*: Geol. Surv. Can., 54 pp., 1910.

² Kindle, E. M.: *Notes on the Iron Ores of Mackenzie River Valley*: Geol. Surv. Can., Summ. Rept., pt. C., pp. 1c-2c, 1919.

³ Tyrrell, J. B.: *Natural Resources of the Barren Lands of Canada*, *Scottish Geographical Magazine*, vol. XV, p. 134, 1899.

¹ McInnes, Wm.: "The Basins of Nelson and Churchill Rivers", Geol. Surv. Mem. No. 30.

² G. H. Blanchet: *An Exploration into the Northern Plains North and East of Great Slave Lake, etc.* *Can. Nat.*, vol. 38, p. 186, 1924.

of these falls to have a drop of about 100 feet.¹ He states that "from the portion of the river seen it was decided that as a power proposition it is almost unrivalled, but it is unnavigable." The southwestern side of Great Slave lake is rimmed by a limestone scarp comparable with the one over which the Niagara river drops to the Ontario lowland. The Hay river in crossing this scarp forms the Alexandra falls with a drop of 105 feet and a second lower fall below it (See Fig. 27). The Alexandra falls are located 40 miles from the lake at the northern margin of a great unoccupied grazing region.

Various other great undeveloped sources of power in northern Canada could be mentioned. Among them are the rapids of the Great Bear river, where this stream crosses the Franklin mountains, and Bloody falls on the Coppermine river.

There is perhaps no other phase of economic development in which such rapid strides are now being made as in the utilization of hydro-electric power. Although Canada has not yet begun to develop this power north of 56° she greatly out-ranks in her developed power every country in Europe. Developed Canadian power is twice that of Italy, her nearest European rival, and exceeds the combined hydro-electrical power development of South America, Asia and Africa by 1,692,000 horsepower according to a recent press bulletin of the United States Geological Survey. These comparative figures have real significance when it is understood that the great reserves of power in the northern half of the country are still untouched and only a beginning has been made in utilizing Canada's "white coal."

THE ARCTIC ISLANDS

A vast area of unexplored lands is represented by the large islands north of the Arctic coast of Canada. The approximate position and coastline of most of these islands was determined by the various expeditions which were so long engaged in searching for a "northwest passage" to the Orient. Various scientific expeditions including the Canadian Arctic Expedition, have contributed to the extension of knowledge of parts of the coastal zone of some of them. Concerning Baffin island, the most accessible of the Arctic islands, which is about one thousand miles long and from one hundred to four hundred miles wide, we have only a very limited knowledge, although the first attempt to mine the precious metals in North America was made there. Ellesmere island, the most northerly of the Arctic

islands, is better known, as a result of the work of Norwegian and other scientific expeditions, than any other of the large islands. In Bylot island the Fifth Thule Expedition^{1a} found "sandstone and clay alternating with beds of coal", about 50 bags of coal being used every year. Both the McMillan and Sverdrup expeditions report thick beds of coal on Ellesmere island. Both coal and copper are known to occur in the southern part of Victoria island.

The Arctic islands, although in the same latitude as Greenland, are not covered by ice caps as that great island is. A rather light snowfall appears to characterize the parts of the Arctic archipelago which are best known. Stefansson states that 75 to 90 per cent of the surface of Arctic lands is nearly free of snow at all seasons, since the little that falls is swept into the lee of the hills. One of the Northwest Mounted Police patrols, in going from Chesterfield inlet to the Arctic coast, found some difficulty in keeping to a route with sufficient snow for their sleds.

J. G. McMillan, who wintered on Melville island in 1909, notes that "caterpillars were observed crawling about on the ground in sheltered places" a few days after May 10th.¹

Concerning the summer climate of the Far North we have statements such as the following from Sverdrup which refers to the summer weather in Ellesmere island, the most northerly island yet discovered:—"The sun now (July 3) burnt just as it does on the Norwegian mountains on a really hot summer day."²

Most, if not all, of the Arctic islands are the grazing grounds of caribou and polar cattle or musk-oxen. Stefansson's description of the summer landscape in one of these islands may be quoted here as representative of a large share of these Arctic grazing lands. "The hunting and exploring trip into the interior of Banks island was an interesting and delightful one for Storkerson and me. Here was a beautiful country of valleys everywhere gold and white with flowers or green with grass or mingled green and brown with grass and lichens, except some of the hill tops which were rocky and barren. These hills differed in colouring, especially as seen from a distance, not so much because of the colours of the rock as because different vegetation prevails in different kinds of soil and different lichens on different rocks. There were sparkling brooks that united into rivers of crystal clearness, flowing

^{1a} A. P. Frenchen and T. Mathiassen. *Geog. Review*, Vol. 15, 1927, p. 252.

¹ Bernier, J. E.: Report of the Dominion of Canada Government Expedition to the Arctic Islands and Hudson Strait on board the D.G.S. *Arctic*, p. 407, 1910.

² Sverdrup, Otto: *New Land*, vol. 1, p. 185, 1904.

¹ *Ibid*, p. 187.

over gravel bottoms.”¹ . . . “The winter snowfall is far less than in such countries as Montana, where stock feed out all winter.”² All the information available concerning the indigenous fauna and the vegetation of the Arctic islands indicates that considerable portions of them may be classed as grazing lands. On these the domestic reindeer would undoubtedly thrive and support as large a population as it does near the Arctic shores of Europe.

The future development of aerial navigation will give to this part of Canada a practical interest and value which it does not yet possess. Arctic ice floes form an effective bar to marine navigation on a commercial basis among the Arctic islands, but aerial navigation over an ice-blocked sea is safer than over an ice-free sea. Man's conquest of the air will enable him to take advantage of the principle of what is called great circle sailing. To go west or go east from many points in the northern hemisphere, the shortest way will be to fly north over the Arctic islands. With the perfection of aerial navigation it will become an absurdity for anyone going from England to Japan to travel by way of New York or Montreal. They will, if they wish to go by the most direct route, fly over the Greenland sea and the Arctic islands.

Stefansson makes the surprising observation concerning one of the new islands discovered by him, that he saw there, in a whole summer, only one mosquito. The uniqueness of a mosquito-less island in the Arctic sea can be best appreciated by experienced Arctic travellers who know the wide distribution of this pest. If Loughheed island remains undiscovered by the mosquito it should become immensely popular as a summer resort in the future when the liners of the air have made the farthest Arctic islands more accessible to southern Canada than Florida is today.

FISHERIES

John Cabot's report on his return to Europe from the Labrador coast in 1497 concerning the shoals of cod which he declared to be so numerous that “they sumtymes stayed his ships”, resulted in all the countries of western Europe sending fishermen to the new fishing grounds, which have been exploited with abundant success down to the present.

The lakes, rivers, and small streams of the Northland are nearly everywhere abundantly supplied with fish. The vast number of lakes in northern Canada provide almost unlimited pos-

sibilities for the future development of inland fisheries. In all parts of the North large quantities of fish are cured in summer, usually by drying, for the use of men and dogs in winter. Dogs are fed almost exclusively on fish.

The great importance of fish to the northern Indian is illustrated by one of Sir Alexander Mackenzie's stories. An Indian chief, near the Pacific, was informed by Mackenzie that Great Britain owned the sea, and if he failed to treat him well he would inform his King, who would stop the salmon from ascending the rivers. The intimidation produced the desired effect.

The Yukon river and its tributary streams have, throughout the summer season, an abundance of salmon which supplies a considerable portion of the food of prospectors and others living near the larger streams. In various places along the Yukon where the current is strong, ingeniously constructed water-wheels are placed, to the paddles of which are attached boxes set at such an angle as to pick up the salmon as they bump into the wheel in ascending the river and spill them into a boat moved alongside. This ingenious arrangement relieves the prospector of all the ordinary labour of fishing and leaves him only the work of cutting up and drying the fish for the use of himself and dogs in winter. The Pacific Coast salmon is not known in the Mackenzie basin, if one or two rare catches be excepted. A wealth of fish, however, is found both in the rivers of the Mackenzie basin and in the large lakes connected with them.

The fisheries of Great Slave lake have long possessed considerable commercial importance to the people of the region. McConnell reports that about 40,000 fish were cured at the Big Island fishery near the western end of Great Slave lake during the season of his Mackenzie river journey. Fish of various kinds are taken with nets and hooks in Great Slave lake throughout the year. But the bulk of the fishing in this lake is done between the 20th of September and the 10th of October when fish are especially abundant at certain localities and the approach of cold weather makes preserving them easy and certain. The most abundant and valuable fish in Great Slave lake is the white-fish, (*Coregonus clupeiformis*), which is widely distributed throughout the northern rivers and lakes. This fish, in the western part of the lake, averages about three pounds in weight. With it is associated the lake trout, (*Salvelinus namaycush*), which sometimes weighs more than 30 pounds, and the inconnu (*Stenodus mackenzii*). The greyling, pike and various other species occur in abundance in the North. Ac-

¹. Stefansson, V.: “The Friendly Arctic,” MacMillan Co., p. 247, 1922.

². Stefansson, V.: *Op. cit.*, p. 585.

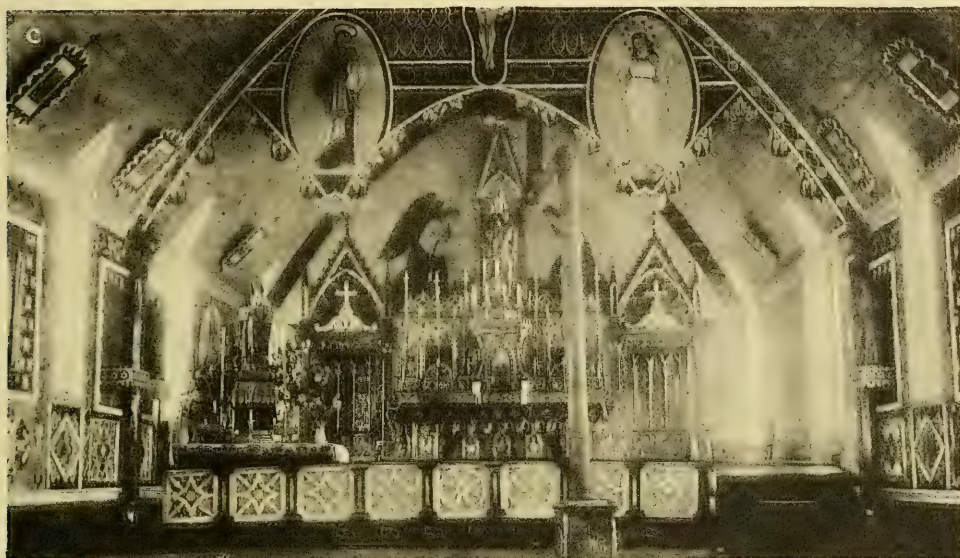
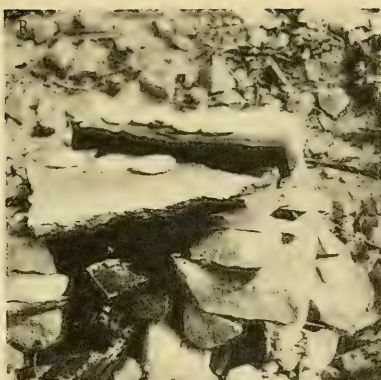


FIG. 30. A. THE STEAMBOAT *Mackenzie River*.

B. BAKING ON A STONE OVEN.

C. INTERIOR OF A ROMAN CATHOLIC CHURCH AT FORT GOOD HOPE, MACKENZIE RIVER, NEAR THE ARCTIC CIRCLE.

D. A HALF-BREED WOMAN AT NORMAN, MACKENZIE RIVER.

E. INDIAN BOY AND GIRL AT NORMAN.

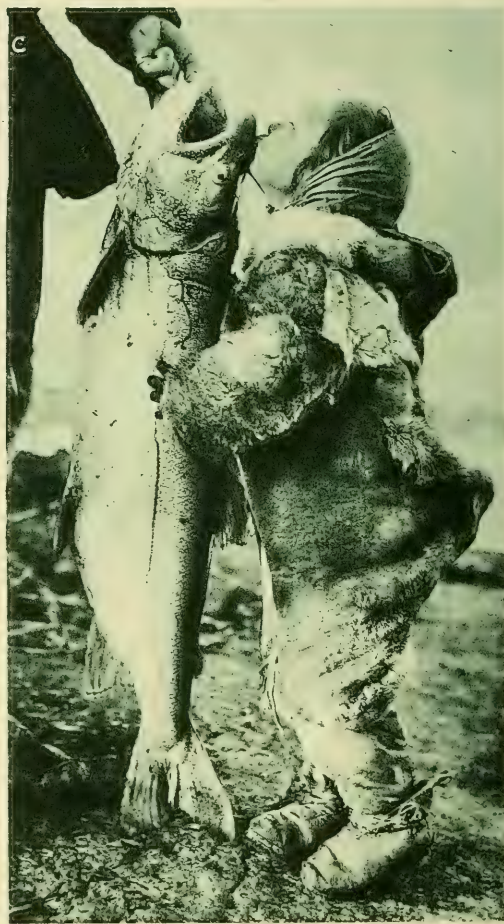


FIG. 29. A. THE END OF A PERFECT DAY SOMEWHERE IN THE NORTH.
 B. A PHOTOGRAPHER-FISHERMAN, HAY RIVER, GREAT SLAVE LAKE.
 C. TROUT TAKEN AT POINT EPWORTH, ARCTIC COAST OF CANADA.

cording to O'Neill¹, in the region near the Arctic coast "fish may be obtained in large quantities in most of the rivers at certain seasons and in the larger lakes all the year around." Everywhere in the North fish is the great staple of the country which stands between the native races and starvation when other food supplies fail, though the Arctic coast seal meat largely replaces fish in supplying winter food for dogs.

The investigations of the naturalists of the Department of the Naval Service indicate that Hudson bay possesses large potential resources in its undeveloped fisheries. The Greenland cod-fish is found on the eastern coast of Hudson bay as far south as Eastmain river. C. D. Melville states that "there can be little doubt that the whitefish industry of James bay will prove to be one of the most prolific in Canada, equalling, if not surpassing, the fisheries of the Great Lakes." Little is known of the fish on the west coast north of the Churchill. Nap. A. Comeau investigated the fishery problem of the coast near the Nelson river and reported that "during the time I was on the Nelson, especially on my last trip in September, we could easily, had we devoted our time to it, have taken with our short seine, from eight hundred to a thousand pounds of fish daily. In one single haul we caught 689 whitefish. On the Hayes river, near Fishing island, a haul of 100 fish is frequently made. Even at a moderate price, this would be quite a lucrative business, provided it could be shipped fresh to market, as will be the case in a year or two. Some experiments that we made in salting a few proved very satisfactory."²

Tyrrell testifies to the quality of the fish of Hudson bay in the following words:³ "Salmon of the very finest quality are found in abundance both in Hudson bay and strait. I have several times procured them from Eskimos and can testify as to their superior quality". Both Hanbury and Richardson report a trout in the rivers of the Arctic coast closely resembling the sea trout of England.⁴ The abundance of fish at certain points in Arctic Canada is shown by one of Hearne's⁵ stories. On the Coppermine river "he saw an old woman, almost blind, sitting by the side of the water, killing salmon which lay at the foot of the fall as thick as a shoal of herrings. Their numbers at this place were almost incredible, perhaps equal to anything that is

related of the salmon in Kamschatka, or any other part of the world."

It is quite possible that the abundant fish of our Arctic coast may eventually be used by some of their future inhabitants for the winter food of domestic animals just as sea food is now used on the Arctic coast of Russia for cattle and swine. E. Reches¹ states that on the south coast of the White sea in Arctic Russia "the cattle and swine are mostly fed on red herrings" which "swarm in such quantities that they may at times be taken in bucketfuls." The photograph (Fig. 29c) shows an Arctic coast trout.

It is a generally recognized principle of marine biology that the abundance of life in the sea increases regularly in passing from the tropical to the polar regions. The abundance of marine fishes may therefore be expected to increase rather than decrease north of the long exploited cod fisheries of the eastern coast of Labrador. The distance from markets is the chief bar to developing fisheries far north of the Labrador fisheries.

A number of whaling vessels have for many years been engaged in whale fishing in Beaufort Sea off the northern coast of Canada. Whaling stations have been operated at a few points adjacent to Hudson bay. The profits under favourable conditions, of one cruise of a small whaler are suggested by the following extract from Inspector G. L. Anderson's report dated Ft. Macpherson Feb. 16, 1910. "The *Karluk* cruised in the neighbourhood of Baillie island and Banks island on September 23, having killed eleven bowhead whales, eight of which I understand were taken in Canadian waters, north and east of Cape Parry. The value of this cargo of eleven head, is, by an estimate at the present low price of bone, eighty-five thousand dollars. The *Karluk* is wintering at Herschel island and will return to the eastward by first open water. As she will have the field to herself for at least six weeks before any other ships arrive from the westward, the chances are that she will make another large catch, and will no doubt leave in the fall of this year for San Francisco with a cargo of bone valued from one hundred and fifty thousand dollars upward. The value of the trade of the *Karluk* in pelts will also be several thousand dollars."

OCEANOGRAPHY AND MARINE TRANSPORTATION

North of Alaska and the western part of the Canadian Arctic coast the continental shelf has considerable width. The shoaling of sea

¹ O'Neill, J. J.: Canadian Arctic Expedition, 1913-1918, vol. XI, Geology and Geography, p. 73A, 1924.

² Dept. of Naval Service, Reports on Fisheries Investigations in Hudson and James Bays and Tributary Waters in 1914, p. 77, 1915.

³ Tyrrell, J. B.: Through the Sub-Arctic of Canada.

⁴ Hanbury: Sport and Travel in Northern Canada.

⁵ See "The Unexploited West", p. 347, 1914.

¹ Elsie Reches: The Earth and its Inhabitants, vol. 5, p. 355.

begins far from land which results in the absence of good harbours west of Herschel island. The shallow sea and scarcity of harbours, combined with the presence throughout the summer of the ice pack at variable distances from the coast, make navigation around Alaska to the Arctic coast of Canada impracticable except for vessels like the whalers which are prepared to winter on the coast. Various explorers have shown the uncertainty and difficulty of navigating the narrow inter-island channels northwest of Baffin island owing to floe ice.

A characteristic feature of Hudson bay is its relative shallowness. Very few soundings in the deepest parts exceed 125 fathoms and none of them equal the depths found in some of the narrow inlets and fiord-like waterways on the eastern side of the Labrador peninsula. Around the southern end of James bay and the southwestern side of Hudson bay the seaward slope of the sea bottom is only two or three feet per mile for long distances from shore. This shallow coast makes the difficulties to be overcome in developing sea port approaches to Moose Factory, Nelson, and other points on this coast very great and quite comparable with those encountered in making a sea port of Buenos Aires. Along the northern part of the western shore of Hudson bay, however, the shallow coast gives way to relatively deep water. Whereas the charts show a depth of only $2\frac{1}{2}$ to 6 fathoms at the mouth of the Nelson river, the entrance to Chesterfield inlet has 20 fathoms, increasing to 30 fathoms at 100 miles distance from the sea. This inlet, which can be ascended to its head by ocean-going steamers, is open for three months in the year. From its head it is only 580 miles to the Copper mountains west of Coppermine river over a gently undulating country.

It may be pointed out here that the distance by sea from Chesterfield inlet to Liverpool is less than the distance from New York city to Liverpool. This is a fact of vital importance in connection with the future development of reindeer herding in the Arctic Prairies which border the western side of Hudson bay. It is equally important with reference to the future development and utilization of the Coppermine River and Bathurst Inlet copper deposits, which appear to be among the most extensive deposits of native copper in the world. Bathurst Inlet copper could be shipped to any Atlantic seaboard city by an all sea route except for 125 miles across the peninsula between Chantrey inlet on the Arctic coast and Wager bay on the northwest coast of Hudson bay. The construction of a motor road or railway across this peninsula may be

shown by future investigations of the geography and hydrography of the base of the Melville peninsula to be the most economical method of getting these ores to market.

Port Churchill, at the southeastern extremity of the Barren Lands, is generally open five months of the year, June 19 to November 18, the shortest season known being four months and eight days, and the longest five months and eighteen days.¹

The navigation of Hudson bay is limited by the prevalence of ice floes to the summer and early autumn months. The length of the period during which navigation is possible and reasonably safe will doubtless vary in different years as it does elsewhere in the northern seas. The late Mr. W. A. Bowden, formerly Chief Engineer, Department of Railways and Canals, has been quoted concerning the relative hazard of navigation in Hudson bay as follows: "Navigation to Port Nelson is as safe as to Montreal. An unprotected steamer had no difficulty in making the straits, leaving Port Nelson on October 22nd. This was an ordinary single-decked tramp steamer without any ice strengthening whatever, 290 feet long, 3400 tons, named the *Sheba*. I purposely did not strengthen the three ships which we purchased—the *Sheba*, the *Sharon*, and the *Durley Chine*. I decided that it was desirable in the interests of the project as a whole to know what an ordinary vessel could do. These vessels made a number of voyages to the Bay without any trouble, going early and coming late."

Some idea of the probable future value to Canada of sub-Arctic sea ports may be gained by referring to the port of Archangel which had at the time of the 1917 revolution a population of about 42,500. This Russian sea port located on an arm of the Arctic Ocean within 2° of the Arctic Circle affords a striking example of an Arctic port which has played a most important rôle in the commercial development of north-eastern Europe. For nearly a century and a half previous to the construction of St. Petersburg, Archangel was the only mart of the Russian import and export trade. Although closed by ice six months in the year the importance of this Arctic port to Russia was emphasized as it had never been before at the beginning of the World War when all of her other ports were closed.

The short sea route to Europe commanded by ports on the western side of Hudson bay, and their relation to the shipment of western grain and the mining products which may be expected from the Precambrian belt of the Northwest

¹ Tyrrell, J. B.: The Natural Resources of the Barren Lands of Canada. *Scottish Geographical Magazine*, vol. XV, p. 137, 1899.

Territories, give them a strategic position comparable with that which Archangel holds with respect to northern Europe.

SETTLEMENT

If the growth of population in all parts of Canada is a desirable thing, there is no part of the Northland which needs more to be brought to the notice of the public than the Arctic coast and the region northwest of Hudson bay. If it can be demonstrated that large settlements of the white race can live in that region as contentedly and happily as the Eskimo do, the vacant lands to the south will fill up fast enough to put our frontier railroads on a paying basis at an early date.

Professor O'Neill, after describing the climate of the Arctic coast, where he spent two winters, writes:¹ "It may be seen, then, that as far as the climate is concerned, there is nothing to prohibit settlement. Game and fish abound and there should be little difficulty in establishing a mining industry if the mineral deposits prove to be valuable. Underground mining could be carried on throughout the whole year without much inconvenience."

The lowest temperature recorded during his second winter on the coast was -44° . The minimum temperature for the same season (1915-1916) at Edmonton was -45° . Conditions which appear to decidedly encourage settlement on the Arctic coast are stated by Professor O'Neill as follows: "The sun is quite hot in April, the seals come out on the ice and the caribou begin their migration to the northern islands. In May, the wild-fowl arrive and after them the small birds; the sun shines for twenty-four hours and the vegetation responds rapidly, so that by the middle of June many wild flowers are in bloom, the slopes and the valleys are green and small animals are seen everywhere."

"Waterpower in abundance for mining operations and probably enough to take care of local transportation, is available from Coppermine, Tree and Hood rivers. Coppermine river, at Bloody falls, is sometimes open all winter."¹

The ground is free of snow for three or four months in the year. Timber for building purposes is available at various points in the river valleys near the coast. Driftwood is common at many points on the coast. Coal is available in two or more of the adjacent Arctic islands on Horton river and elsewhere inland.

All of the evidence indicates the Arctic coast of

Canada to possess a climate subject to fewer extremes of temperature than northern Ontario or the Prairie Provinces. Summer frosts may be expected, but they are by no means unknown or even rare in the country between Sudbury and Porcupine, a region long ago demonstrated to be suitable for agriculture.

Anyone unfamiliar with Anglo-Saxon conservatism might suppose that the publication of such convincing testimony as that cited above concerning the habitability of the Arctic coast of Canada would promptly start a stream of emigrants toward the north coast. But most Canadians have read yarns about the terrors of the Arctic for too many years to believe the truth when it is given them.

The people of the central United States have so long endured the terrific summer heat of the interior of the continent that they consider it one of the necessary and unavoidable hardships of an agricultural country. In the malarial belt of the United States the certainty of perfect health with the possibility of wealth in the north and complete immunity from malaria would probably be outweighed by the widespread belief in the impossibility of comfortable living within the Arctic Circle.

It is useless to tell the English or the French about a country where the continuous summer thawing of the sub-soil furnishes moisture to vegetation as it is needed with a certainty and uniformity unknown in southern latitudes and where twenty-four hours of sunshine in June nearly doubles the rapidity of growth known in the south. Like the Man from Missouri he must be shown and the way to show him is to encourage emigrants from the northern part of the Scandinavian peninsula and Iceland to begin the development of Arctic Canada.

However encouraging reports concerning the climate, fisheries, minerals and grazing conditions may be, settlement of the Canadian Arctic will be long delayed unless the first settlers are introduced from other Arctic lands. Settlers from northern Norway, Sweden and Finland would be almost certain to make contented and successful colonists in the Canadian Arctic because they would find a climate and environment nearly identical with those to which generations of their ancestors have been accustomed. The introduction and development of reindeer herding may be regarded as an important and necessary feature of the settlement of parts of northern Canada.

The northerly limit of settlement in Canada need not be and will not be dependent on the climatic limitations of agriculture any more than

¹ O'Neill, J. J.: Canadian Arctic Expedition, 1913-1918, vol. XI, Geology and Geography, p. 72A, 1924.

it is in Norway. North of Trondhjem in Norway, located near latitude 63° , as the land becomes hostile to cultivation the people turn to the sea for their living. Even the farmers there live largely on fish and when root crops fail or prove inadequate, the cattle are made to accommodate themselves to fish offal.¹ The coastal strip of Norway as far north as Hemmersfest in latitude 71° has a population of 120 people for each linear mile.² These facts afford some intimation of the large population which the vast sea-coast line of Arctic Canada could, and at some time will, support.

The lure of gold in the Yukon basin will probably result in many additional widely-spaced settlements and mining camps when the prospector has had time to locate the Eldorados which await discovery in the extensive mountain region between the Yukon and Mackenzie River valleys. Perhaps no better method of stimulating and increasing the results of the prospector could be devised than extra-mural courses or extension lecture courses for prospectors by western universities.

Into the vast unoccupied area in northwestern Canada between the Peace and Liard rivers the stockman and farmer will probably move rapidly enough when the opportunities and possibilities offered by the region are widely known. The lowlands around Great Slave lake, the valleys of the Slave river and the Upper Mackenzie will eventually develop as an agricultural region. In eastern Canada the farmer will gradually extend his conquest northward around the shores of James bay.

The Canadian Government has wisely established experimental farms at different points on or near the present northern limit of settlement. In one case—Fort Simpson, in latitude $64^{\circ} 40'$ —the experimental farm is hundreds of miles north of the present agricultural frontier. Some of them, like the Vermilion station on Peace river in latitude $58^{\circ} 30'$, have been maintained long enough to demonstrate just what are the agricultural possibilities and limitations of the region near them. The intending settler should secure from the Canadian Department of Agriculture, in advance of his entry into the region where he contemplates farming, the reports of the experimental station nearest the point where he thinks of locating. From these he will learn to what extent he must modify or change the methods he has practised elsewhere to fit the new climatic and soil conditions to which he must adjust him-

self if success is to be attained. It is also of the utmost importance that he have the precise and detailed information concerning precipitation and other climatic factors which some of these reports contain, for it is to a large extent the climatic factor which determines the kind of crops which should be grown in any region. In eastern Canada the reports of the Kapuskasing station of northern Ontario and in western Canada those of the Beaver Lodge and Vermilion stations will furnish this important information for parts of the northern agricultural frontier.

The settler from the south will find Autumn a most delightful season in James Bay basin and in the basin of the Mackenzie. The birch and poplar of the forests put on the same festive colours which delight the eye farther south in October. In the north, Autumn is ushered in by nightly displays of the Aurora. The magnificence of these celestial pageants of colour, often covering nearly the entire dome of the sky, baffles description. The silent stately movements of the great belts, streamers and pencils of delicately tinted light, give to the northern nights a mysterious and spectacular beauty unknown in southern latitudes. The snow, which follows not far behind the first displays of the Aurora, gives a perfect setting to these gorgeous exhibitions of colour. With the snow come frozen trails and streams and the ease of travel over the icy roads furnished by streams and lakes and the trails hardened by frosts. The emigrant who comes to northern Canada from the Central or Middle Atlantic States or southern Europe will exchange a winter environment of occasionally frozen mud and a bare, drab winter landscape for the cleanliness, healthfulness, and beauty of the White North. Allies of cleanliness and health comparable with the powdery snow and low temperatures which prevail for half the year in northern latitudes are unknown elsewhere. They completely bar from northern Canada malaria, hookworm and numerous other diseases common to southern latitudes. The complete immunity to many germ diseases which the northern climate gives, more than compensates for its winter severity.

CONCLUSION

For three hundred years emigration and civilization in North America have been moving toward the setting sun. During the next hundred years this movement will be as steadily toward the midnight sun as it was towards the sunset throughout the last three centuries. The nearly complete occupation of the good vacant land in the United States and southern Canada has already started this northward movement. Since

¹ Vallaux, Camille: *Geographical Review*, vol. XIV, p. 512, 1924.

² Vallaux, Camille: *Op. cit.*, p. 647.

*Fig. 31*

the "Great West" has filled up, its long-potent lure will yield to that of the Great North. How great a part the development of aerial transportation will play in stimulating the future northward movement of population in Canada cannot yet be clearly foreseen, but that it will be comparable with the influence exercised by railways in peopling the West during the second half of the last century can hardly be doubted (Fig. 28A). The aeroplane and radio may be expected to encourage the settlement of northern Canada in somewhat the same way as the trans-continental railways of an earlier period helped to open the West to civilization.

Northern Canada is a land of great promise. Vast potential agricultural resources, undeveloped fisheries, coal and waterpower in abundance, and most of the useful minerals as well as the precious metals are known to occur there. Anyone who should venture to predict the number of millions who will some day make it their homeland would be accused of unbridled optimism.

We are still, however, in a period when the public gives more credence to unfavourable than to favourable opinions of sub-Arctic Canada. With reference to the possibilities of our northern

empire the average man probably feels somewhat the same uncertainty that the average Englishman felt in the first quarter of the 17th century about the future of the New England colony. The tales of hardship sent back to England by the Plymouth colonists who barely escaped starvation during their first winters in the New World must have sadly shaken the faith of John Bull in the future of a country so desperately cold as New England.

The history of the settlement and development of the Dakotas should be reassuring to anyone who doubts the future of northern Canada. Few parts of Canada can show such an extraordinary combination of obstacles as that which the early settlers had to meet in the blizzard-swept region now known as North and South Dakota. Fifty to sixty years ago wave after wave of emigrants from the eastern states and the north of Europe entered the Dakotas to fight for homes against frost, drought, grasshoppers, and hostile Indians. It is a matter of common knowledge that these pioneers after various campaigns won out and gave to the Union two of its most virile and valuable commonwealths.

Anyone with a sense of humour and some first-

hand knowledge of the country north of 56° will find many of the serious descriptions of it by writers having a limited supply of facts and unlimited imaginations most amusing. The following quotation from Eliot Coues' description of Labrador is an example. "Fogs hang low and heavy over rock-girdled Labrador. Angry waves, palled with rage, exhaust themselves to encroach upon the stern shores, and baffled, sink back howling into the depths. Winds shriek as they course from crag to crag in mad career, till the humble mosses that clothe the rocks crouch lower still in fear, etc."

Coues was a naturalist of real ability but much of his work was done in a quarter of the United States where ice never forms and where rain is about as rare as snow in Florida. If we look up the antecedents of the men who have painted the horrors of an Arctic winter in the darkest colours we are apt to find at least a partial explanation in their previous environment. Kane, one of the explorers of the Arctic archipelago, who had some unpleasant experiences including a thousand-mile drift among the ice-floes, tells us that he was enjoying the sea-shore life in the tropics when orders to join an expedition to the Arctic reached him. Is it any wonder that the hardships of the North have the prominent place in his writings which we might expect sunstroke and torrid heat would have in an Eskimo's description of New York city? In Stefansson we see the effect of an antecedent environment and heredity just the opposite of Kane's. Stefansson is probably telling the real truth when he states that his greatest winter adventure was near his father's barnyard in North Dakota when he became lost during a blizzard and barely escaped freezing. In the Far North he reports having failed, after several years' search, to discover the climatic rigours or the hardships of many previous explorers, but found everywhere the "Friendly Arctic". In giving him this viewpoint toward Arctic Canada, Stefansson's Icelandic ancestry and his boyhood environment in Manitoba and North Dakota are undoubtedly strong factors, but there is not much doubt that it is a far truer and fairer estimate than the one we find in the writings of such authors as Coues and Kane. Other members of the Canadian Arctic Expedition have published little about their observations on Arctic climate but it is a rather significant fact that a member of this expedition who entirely escaped from frost bite during several winters spent in Arctic Canada, froze his ears the first winter after his return to Ottawa.

As a teacher of thrift and industry, Old Jack Frost has no peer. The happy-go-lucky ways of southern climes will not be tolerated in his domains. Those who are diligent in acquiring these fundamentals of a full and useful life are nearly certain to be rewarded with vigorous health, if not with wealth. The certainty of having to provide against occasional winter temperatures of 40° or more below is more effective than any statute in keeping out of northern Canada the mollycoddle and other undesirables. In the virile verse of Service:

*"This is the law of the Yukon and ever she
makes it plain.*

*Send not your foolish and feeble; send me
your strong and your sane."*

A land with a frontier guarded by so searching a critic of immigrants as Jack Frost, must be expected to grow slowly like the oak, and with the same strength of fibre. But it is destined to acquire a population which will eventually be large and show the fine qualities which another northern land implanted in the old Vikings of Norway.

If there are no new continents for these northern Canadians of the future to discover there will be new worlds in science, literature, and the field of human progress awaiting exploration and conquest. The ideas which can "raise men out of the world of corn and money" are the most valuable products of any country. We may expect a land which feeds the imagination and fancy with nightly displays of the Aurora Borealis to mother a race of men who will find pleasure and inspiration in the phenomena of Nature and the northern "sea that bares her bosom to the moon". The Arctic coast of Canada may yet produce poets who

*"Have sight of Proteus rising from the sea
Or hear old Triton blow his wreathed horn."*

The centres of Canada's industrial and intellectual activity will not remain on the southern border of the country. Science, literature, and the arts can flourish in the northern part of Canada as they do in northern Europe. It was north of 56° in the Old World that Linnæus, the father of modern biology, and that amazing genius, Swedenborg, first saw the light, and we may reasonably expect that the high latitudes of our Dominion will furnish comparable contributions to the future intellectual wealth of the world.



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"Ignorance of the history of science easily makes the wisest of us an ass."

—DR. JONATHAN WRIGHT.

CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF NORTH-EASTERN LABRADOR

By BERNHARD HANTZSCH

"Beitrag zu Kenntnis der Vogelwelt des nordoestlichsten Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechshundfünfzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July, 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II. Besonderer Teil (Detailed Part), pages 307-392.

(Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.)

II. DETAILED PART

(Discussion of the Species of Birds Known for the Region)

Colymbus griseigena holboellii (Reinhardt). [*Colymbus holboelli* (Reinhardt) of A.O.U. Check-List.] *Holboell's Rothals-Taucher*. HOLBOELL'S GREBE.—This species, according to the descriptions on the part of the natives, might touch our district as an occasional migrant and occur now and then on the lakes in the interior of the country, unless it has been confused with *Colymbus auritus auritus* L. (Horned Grebe), since authenticating specimens are lacking. Turner likewise did not venture to determine the species of the bird which he observed in one individual on September 15, 1882, at the mouth of the Koksoak, S. Ungava bay (1886, p. 253). In Prince of Wales sound, northern Labrador, *C. g. holboellii* was often seen by Payne in the summer of 1885 (Macoun, I, p. 2), and missionary W. Perrett⁷ received a fall specimen at Maggoviik, northeastern Labrador. According to W. A. Stearns, the species is reported to occur not rarely in southern Labrador (Proc. U.S. Nat. Mus., vi, 1884, p. 122). In Greenland it has likewise been captured as an occasional visitor (H. Winge, Grönlands Fugle, 1898, p. 131).

⁷ I owe a large number of complete communications to this good bird expert, who was active at the different mission stations; he was posted at Killinek in 1905-1906, and is now in active duty at Nain, as I have already remarked; bird species not positively known to him were always sent to American ornithologists for determination.

Podilymbus podiceps (L.)—(p. 308). *Geffecktschnäbliger Taucher*. PIED-BILLED GREBE.—I mention this species, which may push on as an exceptional visitor as far as northeastern Labrador, because of a male of the spring of 1901, which was killed in the region of Rama, passed through my hands, and is now in the collection of the Count Arrigoni Degli Oddi in Padua (*in litt.*).

Urinator imber (Gunn.). [*Gavia immer* (Brünnich) of A.O.U. Check-List]. *Eis-Taucher*. LOON.

Eskimo: *Tállik*, -'ik, -'it,⁸ (most probably from the voice).

Widely distributed, but by no means an abundant breeding bird on the freshwater lakes, from whence he visits the quiet, inner parts of the bays abounding in fish; only in season of migration observed farther out on the sea. Also widely distributed in all neighbouring districts.

A specimen in my collection, ♂ (?), of July, 1906, from Hopedale, bears all the characters of the species, even if the tip of the bill is coloured whitish-gray. The measurements are as follows: Wings: 360 mm. Tail: 100.⁹ Length of bill: 85 (with another adult specimen from Killinek, on the other hand, only 76). Upper mandible from corner of the mouth out: 104 (98). Depth of bill at base: 26 (26). Tarsi: 89. Middle toe including the 14 mm. long claw: 117 mm.

The Loon, on account of his size and striking voice, is well known to the native population. In truth, even in that country, he shows himself as exceedingly wary and seeks at once to escape an apparent danger by diving or flying. In flight,

⁸ Singular, Dual, Plural. The mark ^ denotes an extension, ˘ a shortening of the vowel.

⁹ I take the tail measurements always in the following way: I bend the tail somewhat upward, place the dividers on the lower back at the root of the longest feather, and measure this to the tip, a procedure which gives a quick and correct measurement of the real length of the tail, especially with a bird in the flesh. This gives somewhat larger figures than the measurement usually employed, which does not appear to me favourable or accurate.

which proceeds very rapidly and mostly high in the air, the bird's call, especially when the pairs are together, often vigorously their *Gek, Gekek, Gikgikgik* . . . (not rapidly.) Almost the whole night of the 17th of August and the following forenoon, I heard from a bird swimming alone in Takpangajok bay, the strong mating call, striking the attention even from a great distance, in which the sounds *a* and *au* ring through especially clear, often screaming wildly, then complaining, as if in pain. (p. 309). Every Eskimo child knows these wailing tones, exciting the phantasy of superstition, by which the species easily betrays itself and gives information as to its whereabouts. The native in his light, noiseless kayak kills these birds often enough. From them he draws the skin—which is now seldom used in the fashioning of garments—and eats the flesh.

Urinator arcticus arcticus (L.)¹⁰ (p. 309).
Polar-Seetaucher.—BLACK-THROATED LOON.

Eskimo: According to Kumlien, in southeastern Baffin island, *Kcdluluk*.

This species does not seem to be known to the Eskimos of our district by a special name; it perhaps occurs, however, as an occasional migrant. I put it down because of the statement of Kumlien that he had observed some specimens in the fall of 1877 near Grinnell bay, in southeastern Baffin island, scarcely 250-300 kilometres distant from northeastern Labrador. He also maintains that the birds breed now and then at Kingua fjord. The first specimen shot there he received on June 24, 1878 (1879, p. 103). Macoun calls special attention to the fact that the species is occasionally met on the Labrador coast and that R. Bell killed adults and nearly full-grown young on August 28, 1884, at Nottingham island in the western end of Hudson strait (I, p. 10). As far as is evident from the literature, in these accounts—which are not always free from objection—the form in question is most probably the form belonging to the Palæarctic district, while the somewhat paler coloured *U. a. pacificus* (Lawr.) is mentioned eastward only as far as Melville peninsula.

Urinator lumme (Gunn.) (p. 309) [*Gavia stellata* (Pontoppidan) of A.O.U. Check-List]. Nord-Seetaucher.—RED-THROATED LOON.

Eskimo: *Kaksau*, -*sauk*, -*saut* (after the voice).

Widely distributed and not a rare breeding bird

¹⁰ *Gavia arctica* (Linnaeus) of A.O.U. Check-List, 1910, although the form from this region is undoubtedly *Gavia pacifica* (Lawrence), Pacific Loon, to which are referred numerous specimens of black-throated Loons from Baffin island, and Mackenzie district, in the National Museum of Canada. It is now generally recognized as merely a subspecies and should stand as *Gavia arctica pacifica* (Lawrence).—R.M.A.

on the larger freshwater lakes, of which there are indeed countless thousands in the country; more abundant than its larger relative, which it resembles so much biologically that in the open the species may occasionally be confused with each other.

A faded breeding bird of my collection, ♀ (?), of July, 1905, from Hopedale, shows the following measurements: Wing: 278 mm. Tail: 72. Bill length: 61. Upper mandible from corner of mouth: 83. Depth of bill: 16. Tarsi: 79. Middle toe including the 10-mm. long claw: 92.

Our bird is well known in spite of its shy nature. Its strong voice makes it conspicuous in the whole great district which it inhabits and often hastens through in high flight. The scarcity of fish in most of the still waters (I found only poor specimens of *Salvelinus fontinalis* Mitch. in them) forces it to range far and to hunt food especially in the quiet (p. 310) inlets of the sea. Always vigilant, the swimming loons rise up even from their breeding ponds rather readily. The Labrador birds in this respect appear far more restless and more shy than the representatives of the species observed by me in Iceland, a thing which is to be explained by the fact that the Iceland birds find food more easily in the waters of their home, which are far more abundant in fish, and therefore become more settled. The stately creatures arose many times a few metres above me, with a loud rustling of the wings, when I found myself right in a narrow valley depression. If, however, they wished to settle down, then they carefully examined things from the upper air, to see if perhaps danger might threaten them. Their flight then is not directed straight out as otherwise, when they put rather long distances behind them, but describes great arches, which at times are carried out in beautiful soaring. At last they let themselves down rather quickly in a spiral line into the middle of a body of water. The pairs keep close together, but in danger desert the young for a time, which latter understand how to make themselves almost invisible by diving. The voice of the old ones, which are heard very often in their excitement, is a more or less continuous goose-like *Gagagagak*, produced with different speed and modulation, the call only a one- or two-syllabled *Kak, Gagak*. The striking mating calls are produced more while swimming. The penetrating cry with which the male holds his female under and forces to pairing, I heard at all times of the day, but especially on sunny calm mornings. It is heard at a kilometre's distance in very different ways and is hardly to be reproduced in words. The sounds *a* and *au* are the more penetrating ones in about equal degree. Many times, when we heard the call as

we prepared [specimens] in front of the tent, my merry Eskimo companion imitated it quite closely by taking the Eskimo name *Kaksau* as a base and drawing out the conclusion with modulation. The Eskimos like to kill this species on account of its size, but it is skinned before eating the flesh, which does not taste especially good

Fratercula arctica arctica (L.) (p. 310) or *Fratercula arctica glacialis* Steph. *Papagei-Taucher*. —PUFFIN.

Eskimo: *Siggyluktok*, -tük, -tüt (*siggok* = bill, snout—*luktok* is substantive form of *lukpok* = has it bad).

I never met this species on my journey. According to the statement of the missionary Perrett their breeding places do not begin on the Labrador coast until southward from Nain. Bigelow notes them as abundant along the Labrador coast (1902, p. 25), and Kumlien asserts that he had observed them northward up to Hudson strait. (p. 311). On the other hand, according to the account of the same traveller, it is unknown to the Cumberland Eskimos (1879, p. 103), a fact which Mr. Crawford Noble quite lately confirmed for me (*in litt.*). Some of the Killinek Eskimos knew the bird, but it is said to occur only as a rare migrant.

Whether this is the larger Northern form *glacialis*, I do not dare to decide at the present time. My opinion concerning the two forms going into one another has not changed since the appearance of my work on the avifauna of Iceland (1905, p. 106), in which I agree, approximately, with H. Winge's view concerning the Greenland representative of our species (Grönlands Fugle, 1898, p. 240).

Cepphus grylle mandtii (Licht.) (p. 311). [*Cepphus mandti* (Mandt) of A.O.U. Check-List]. Mandt's *Gryll-Lumme*—MANDT'S GUILLEMOT.

Eskimo: *Pitsiulak*, -lâk, -lât (after the sound)

Occasional breeding bird and abundant migrant on all parts of the coast. Some are also observed in the winter in such localities where the sea does not freeze over, or at least leaves some hole open.

The Guillemots collected by me in northeastern Labrador, or examined there, must be classified in the above subspecies, even if all the individuals do not show special distinguishing marks equally characteristic. Why, indeed, most ornithological writers distinguish *Cepphus mandtii* and *Cepphus grylle* by a binomial nomenclature, also by other application of a trinomial, is not clear to me. In certain sub-Arctic districts *C. grylle* may always occur as a breeding bird. To the northward, however, might lie a region, embracing parts of Labrador and also—according to Winge—parts of Greenland, in which intermediate forms of both subspecies occur in especial abundance. Finally, clearly marked *C. mandtii* occur in true arctic districts. In the breeding

places characteristic specimens of both forms will scarcely be present at the same time, which [condition] would to some extent justify a separation as species. The difficulty of assigning certain individuals to one or the other form, or even only the omission of a careful examination of existing material, has led to a confusion of the statements about the occurrence of both subspecies, which is aggravated by the application of binomial names. He who considers the characteristic representatives of both forms not merely as extreme appearances of one and the same species, but as different species, will in a not slight percentage of *Cepphus*-skins, not be able to say at all, or only arbitrarily and from a biased standpoint, to what species they belong.

According to my investigations, as a basis for which my material consists of breeding birds collected in Iceland (*C. g. grylle*) and northeastern Labrador (*C. g. mandtii*), the two forms (p. 312) are characterized as follows:¹¹

The general measurements of both are not to be used as unailing distinguishing marks, even if total length, spread of wing, and tail, in birds measured by me in the flesh, are somewhat greater on the average in the case of *mandtii*. On the other hand, the bill in the case of *mandtii* is narrower than in *grylle* (depth at the base about 9 to 10.5 mm.), more slender looked at from above, and more pointed from the front. The wings show still clearer differences, with young birds as well as with old ones. If one looks at the under wing, then the broad white on the inner vane of the primaries which reaches as far as the quill and extends considerably, up to about 25 mm. beyond the under wing-coverts, characterizes *mandtii*. In *grylle*, on the outer edge of the inner web, only a white stripe is to be seen, which does not reach up to the quill and extends beyond the under wing-coverts only slightly conspicuous. I measured as the highest 15 mm., and this specimen also, a winter bird from north Iceland, inclined to *mandtii*. If one surveys the upper wing, then for the quills of both forms there is something similar in their marking. In the case of *mandtii* the white at the base shows up much stronger and occasionally, indeed, shows itself on the tips, especially with freshly-moulted young birds. The primary coverts which in *grylle* are almost one colour of brown-black, have in *mandtii* also much white; occasionally they are spotted up to the tip. The greater wing-coverts and also the white middle wing-coverts are white to the base or have only a small, not too dark stripe along the quill, which does not extend to the outer edge of the feathers.

Occasionally one sees the black on the closed wings, while usually one has to raise the feathers up in examination of the white shield.

There is always, as remarked, the individual keeping the middle ground to such a degree that the determination of a form inhabiting a region can be done only on the basis of a series of breeding birds. Good material for comparison shows differences much better than a description does. In all cases, in the account of one of the two subspecies, one should pay the greatest attention to the question whether it is a case of a breeding or a migratory bird.

¹¹ The plan of this brief work is in general not to give descriptions.

I refrain from citing the indefinite, contradictory notes about the occurrence of both forms in our district; only I wish to point out that Low in his list of birds and eggs which were collected on the Canadian *Neptune* expedition 1903-04, also mentions only *Cephus mandtii*, but not *C. grylle*. They collected eggs and skins of the former at cape Chidley (1906, p. 314). How far *C. g. mandtii* breeds to the southward on the Labrador coast, is still to be determined. (p. 313). A specimen of my collection from Okak, in faded summer dress, though doubtfully a breeding bird, represents an intermediate form, even though with inclination toward *mandtii*.

The measurements of 5 characteristic breeding birds of my collection—2 males and 2 females from the neighbourhood of their breeding island Pitsuitlatse, southward from Killinek, and one male from Rama—as well as 3 winter birds from Rama, are as follows:

Weight in the flesh: 380-400 g. Total length: 323-340 mm.¹² Spread of wing: 550-590. Wings: 149-163. Tail+wing:¹³ 16-26. Length of bill: 25-30.5. Depth of bill at base: 8.6-10.5. Tarsi: 27-32. Middle toe including the 9-11 mm. claw: 41-44.5 mm. Male and female are not to be distinguished from their external appearance; according to my examinations of 10 specimens in the flesh, however, the males are the smaller. Iris: dark brown. Bill: black, inside vivid dark carmine red. Feet: somewhat brighter, glowing carmine red to a fiery red; occasionally the rear side of the tarsi and the under side of the toes washed with blackish. In birds taken from the nest, hardly able to fly; Bill: brown-black, inside brick-red. Feet: front and upper side dusky reddish-brown; rear and under side blackish. 6 stomachs contained in four cases fish remains, once digested crustacean remains, unmistakable prawn remains, 1 *Gammarus*, 1 small snail [Rörig].¹⁴

The graceful, occasionally quite confiding and even curious, guillemots like to stay together near the coast. They are such gentle, pleasing birds, that the sight of them fills the observer with joy. Their quiet manner, with all their activity, is so suited to the lonely, dark sea-cliffs about which they swim, and to the silent ice-fields in the wake of which they like to move about. Even their voices are ingratiating, high and thin indeed, but heard at a considerable distance. Often I became aware of the birds much sooner because of the voice than by perceiving the birds themselves.

¹² Where I give the total lengths this is always for birds in the flesh measured by myself, after *rigor mortis*.

¹³ Indicates thus: Tail, extends beyond wing.

¹⁴ Dr. G. Rörig, professor and member of the government board of the Imperial Biological Institution for Agriculture and Forestry in Gross Lichterfelde (Herr Regierungsrat Professor Dr. G. Rörig von der Kaiserl. Biolog. Anstalt für Land- und Forst-wirtschaft in Gross Lichterfelde) had the kindness to examine for their contents 137 specimens of stomachs of 21 species brought with me from our district. Dr. E. Rey of Leipzig did this with 15 additional specimens of 3 species. My warmest thanks in this place to both gentlemen. I myself examined perhaps 50 stomachs and just about as many contents of crops, especially of seed-eating birds.

The voice is repeated as a long drawn-out *S* with *Y* sounding through it, yet not quite "siess". When close at hand one also detects some fine short preliminary notes, perhaps thus, "*pitsiess*." Whenever a number of guillemots swim about on the water (p. 314) on beautiful, quiet mornings and produce these prolonged calls with open bill, a very fine characteristic concert arises, which is to be confused with no other bird voice known to me. I noticed these tones now and then as late as October. An imitation of the voice certainly lies at the basis of the first syllables of the Eskimo name, *Pitsiulak*, just as in the German, Danish, Norwegian and Swedish *Teiste*, etc.

The birds, usually not difficult to kill, are eagerly devoured by the Eskimos after they have taken the skins from them. Occasionally the Eskimos take eggs and rather large young in such places as they know as regular breeding places of the birds, from the rocky holes. The results in most places are insignificant on account of the difficult terrain.

Uria lomvia lomvia (L.) (p. 314). *Dickschnäblige Lammé*.—THICK-BILLED GUILLEMOT (BRUNNICH MURRE).

Eskimo: In Ungava bay always *Akpa, pāk, -pāt (partim)*. Etymology doubtful: Fabricius observes, "after the voice," which indeed is very little apparent in the case of *Alca torda*, a species which is of importance above all for Greenland. It is not impossible that there is an etymological connection with *ākpa*=to take the skin from a bird, something the Eskimos always do with this species. The name is used farther south on the Labrador coast (as also in Greenland) for *Alca torda*, which is unknown in Ungava bay, while *Uria lomvia* and *troile* are called *Akpavik, -vik, -vit (-vik=large)*; the young of all these similar appearing species are called *Akparak, -kaek, -kat (-arak=a young one)*.

Occasional breeding bird on the Button islands and in the neighbourhood of cape Chidley, from whence the Canadian *Neptune* expedition is said to have taken eggs (Low, 1906, p. 315). I possess only two young specimens, the measurements of which do not yet show the full development. On the 25th of July I observed a splendid colony of the birds on a green bird-mountain near cape Black Bluff on the northeast of Resolution island; in the Labrador district I myself saw no breeding place. The species is said to inhabit the large island Akpatōk¹⁵ in very large numbers, the name meaning, where there are *Akpat* in great numbers; from there, perhaps, come most of the birds which appear at Killinek. Now and then flocks of the creatures, possibly not of breeding age, fly about during the month of August around the east coast of Ungava bay, especially

¹⁵ A large island in northwestern part of Ungava bay.

in the fog and ice. The real migration commenced at the beginning of September. Toward the end of this month considerable numbers appear near the land now and then, but only a few were killed by the people. The birds were all in summer plumage, and not until the last did the moult make itself quickly noticeable (p. 315).

The gregarious, neatly feathered birds are charming attractions of the sea. When they swim curiously about the ship or slowly move about on the waves, they hold body and bill upright. Often they raise the upper part of the body out of the water and flap with their wings, whereupon the white of the lower parts and of the flanks is dazzlingly displayed. Now and then they splash as if bathing in the cold water. Their flight, which takes place in quick strokes, progresses very rapidly; it goes in a great arc for the most part only a few metres above the sea, but is not capable of sudden turnings. The feet are stretched out far toward the rear and held together. If several birds fly up undisturbed, they arrange themselves in a row behind one another. These creatures feel far more secure in their true element, the water, than in the air. Whenever they wish to dive under the water seeking food, they stick the head under the upper surface with a jerk, for a moment one sees the feet raised up alongside the tail, then the bird disappears for some time, usually as long as one to one-and-a-half minutes, to appear again at a different place. The creature now for a short time swims rapidly through the water with its head drawn in and deeply sunk, in order to vanish anew. The voice of our Guillemots, the rumbling *Hrrr*. . . , I heard only occasionally away from the breeding place. Even when they were playing, moving about on the water, they were usually quiet.

The flesh of the Guillemots is eaten eagerly by the Eskimos; they dry in the air the skinned and eviscerated cadavers, from which the legs and head are cut, and keep them for a time of scarcity.

Uria troile troile (L.) (p. 315). *Dünnschnäbelige Lumme*.—COMMON GUILLEMOT (MURRE.)

Eskimo: *Akpavi*, -*vkî*, *vîl* (*Partim*).

This species, which is previously known as a breeding bird farther south, although it also inhabits Greenland in less numbers, must come to the northern Labrador coast only as an occasional visitor. Proofs of it are, to be sure, not extant. I never observed them, myself, in spite of the closest attention. All the thousands of Murres which I clearly observed near by at different times, proved to be undoubted *Uria lomvia* from the unspotted flanks and the bright, shining, cutting edges of the upper mandible.

In the autumn, the colouring of this bill streak was, moreover, not clear lead gray, as I called special attention to in the Icelandic summer birds, but yellowish gray. Our species does not seem to penetrate into Hudson strait. Macoun also calls attention to this (I, p. 22), and Kumlien likewise mentions only *O. lomvia* for south-east Baffin island (1879, p. 105). (p. 316.) It is self-evident that sporadic specimens of the thin-billed Murre would be almost always overlooked.

Alca torda L. (p. 316). *Tork-Alk.*—RAZOR-BILLED AUK.

Eskimo: *Akpa*, -*pak*, -*pat* (*partim*).

The Razor-billed Auk is apparently not a common migrant in our district. At least the Ungava Eskimos do not know or distinguish it. No specimen came within the range of my vision either, although I was constantly watching for the flight and the other peculiarities of the species. According to missionary Perrett this bird does not breed very frequently on the Labrador coast until southward of Nain. However, Bigelow, who came as far as Nachvak, also well northwards up to my region of observation, writes that the species was found in considerable numbers along the whole coast and breeds in company with the Murres. (1902, p. 26). Kumlien also says that he observed *Alca torda* from middle Labrador up to Frobisher bay in different localities, often at some distance from land (1879, p. 103). Macoun, on the contrary, in consequence of Turner's observations, states that our bird does not usually occur in Hudson strait (I, p. 26).

NOTE: It may be asserted with definiteness that *Alca impennis* [the Great Auk] has occurred formerly as far as the middle part of the eastern Labrador coast, at least as a visitor.

The breeding places of these individuals may have been situated on the Funk islands or neighbouring localities. On the other hand, it may be suspected that the visitors to Greenland, apparently not rare for their time, originated in general from the breeding places of Iceland. It is in no way precluded that occasionally some specimens of the species have reached as far as our district, even if no kind of proof exists for it. I could not learn the slightest thing from the natives about the bird. On a slope near Killinek, where there are remains of old Eskimo earth-houses, where I also dug up bones from the earth, with numerous quartzite stones which had been worked, and had a woman looking for it also, no bone of *Alca impennis* came to light. After the detailed descriptions and demonstrations which Mr. Herluf Winge, M.Sc., of the Copenhagen Zoological Museum, kindly made for me in 1903, I should have recognized this bone by its characteristic broad form. Also among the other worked bones, in part very old, which I took out of the Eskimo

graves, and which are now in the Royal Ethnographical Museum in Dresden, there are none of this species. Still it is worth while, to examine carefully for their species, such collections of bones from old Eskimo graves which either are already placed in Museums or are being made, since it is to be assumed that the Eskimos of our district would have liked to use the bones of such a splendid, peculiar and rare bird for amulets, etc. (p. 317). It would be of great interest if the former occurrence of *Alca impennis* should be proved for the west coasts of Davis strait.¹⁶

Alle alle (L.) (p. 317). *Krabben-taucher*.—DOVEKIE.

Eskimo: *Akpaliarsuk*, -sûk, -sûit (*Akpa*=*Uria* and *Alca*, -arsuk=small.)

Common migrant in the late autumn, less numerous in the spring, also a winter bird in open parts of the sea, appearing often in countless flocks. It comes into the inner part of bays or to land at all only in the case of a violent storm; it likes to stay among ice-cakes, which are at times quite covered by the graceful birds. There is for the present nothing known of a breeding of the species in Labrador, although occasionally some birds are said to be observed there during the summer also (Townsend and Allen, 1907, p. 309). According to Eifrig's notes, Dovekies breed also on the coasts of southeastern Baffin island (1905, p. 235), and according to the information of the Eskimos, it is not precluded that they also do in certain places of the Button islands.

10 specimens of my collection, which I killed on 23rd October at Okak, show the following measurements: Weight in the flesh: 138-178 g. Total length: 208-225 mm. Spread of wings: 392-407. Wings: 107.5-113. Tail: 30-42. Tail+wing: 8-20. Bill: 13-15.2.¹⁷ Tarsi: 17-19. Middle toe including the claw: 5-6.5 mm. long 29.5-32 mm. Iris: dark brown. Bill: black. Tarsi and toes on the upper side whitish-brown, yellowish-gray, or whitish-gray; rear side of tarsi, entire soles, as well as webs on the upper side, many times except for a stripe alongside the toes, black. Between male and female I could find no difference from the outward appearance. Yet from all appearances in these 10 specimens it is a case of young creatures of the same summer. At least the sex organs were developed extremely little; the bill is slender, near the nostrils a little wrinkled, its depth at the base about 7 to 9-10 mm. in breeding birds. In all else they were quite like completely adult specimens. The rather much developed winter plumage permits the black-brown of the lower neck to shine through. Six stomachs examined showed: one, a little gray stone; one, fine fish-

bones; the other times little marine crustaceans, especially crabs and Gammaridæ—I often myself found the *œsophagus* stuffed full of very soft whitish crabs.

The appearance of this bird is partly controlled by the appearance of the drift ice. I observed the forerunners (p. 318) of the migration in the middle of October for the first time. A few days later, on the 19th of this month, we were travelling on the way from Hebron to Okak for hours through numerous individuals, which seemed to populate the whole sea at great distances from one another. Until my arrival in Newfoundland on November 16th, I could see right along at some distance from the land more or less numerous individuals of the species.

The graceful creatures are generally confiding, even if not too easy to shoot from the rocking boat. If pursued, they dive quick as lightning and often do not come up until a long distance away, also appearing only for a short time. Undisturbed, they swing light as a feather on the waves, but as long as the sea is free of ice they stay together in crowded flights only during the night and upon long journeys. During the day they scatter on the wide surface of the water and seek crustaceans. Then one hardly ever hears their choked, long drawn-out voices; merely to call one another together they set up their clattering *Gägägä . . . grrr*. When later in the year there are only a few open holes in the ice, they collect there, and then by their animated voices give to the lonely Arctic landscape an enchantment felt in the same way by all observers.

Their flesh is tender and very savoury. The hunt for the little birds is only remunerative, however, when they sit crowded closely together.

Megalestris skua (Brünn.) (p. 318). *Groses Raubmöve*.—SKUA.

This species must visit the Atlantic coasts of North America and also our region annually only as a rare visitor. I mention it particularly because of the statement by Low, that it had been observed by the Canadian *Neptune* expedition 1903-04 rather commonly in Davis strait and also in the eastern part of Hudson strait (1906, p. 315). In addition to this, Kumlien informs us that he saw specimens of this species with young in September (1877?) near Lady Franklin island, situated at the most south-east portion of Baffin island (1879, p. 94). When I travelled through this area in splendid weather on the 25th of July, 1906, I looked carefully at all jaegers, but could discover no specimen of *Megalestris*. That this species was said to breed on rocky cliffs ("they then had young ones on

¹⁶ This species, *Plautus impennis* (Linnaeus), Great Auk, of the A.O.U. Check-List, has been extinct since at least 1870, and probably for a longer time.—R.M.A.

¹⁷ The record of 19-mm. bill length for a breeding bird from north Iceland in my work on the Avifauna of Iceland ("Vogelwelt Islands"), 1905, p. 123, is a regrettable mistake, and should read 14 mm.

the rocks") does not correspond to their usual habits, and it is perhaps not correct to write as Frank Chapman does, for example, as a result of Kumlien's communication, "Nest on rocky cliffs" (1960, p. 65). Positive evidence of the breeding of *Megalestris* in the locality mentioned or even "on the islands of Hudson strait," (p. 319) in which Lady Franklin island does not lie at all, is entirely lacking. There is, generally speaking, no information of the breeding of the species in North America.

Stercorarius pomarinus (Temm.), (p. 319).
Mittlere Raubmöve (Medium Robber-gull).—POMARINE JAEGER.

Eskimo: *Issunguk*, -ak, -at (*partim*); according to G. H. von Schubert, *Gelehrte Anz. d. Bayer. Akad. d. Wiss.*, 1844, p. 422, =the dull one, on account of the gray-brown colouring; cf. *issungarok* = the water is muddy.

Not a rare visitor of the coasts of our district and also a breeding bird. But the land is poor in bird-mountains and flat, grassy, breeding-islands for ducks and the like, in the neighbourhood of which all jaegers like to settle down, even if they do not always do so.

A skin of the light phase in my collection, from the region of Okak, autumn of 1905, to be considered a juvenile bird by the blended, indistinct banding on the lower neck, sides of the body, and tail-coverts, as well as the light tarsi, shows the following measurements: Wings: 331 mm. Tail: 185, the middle feathers project beyond the next shorter ones about 38 mm. Bill: 37. Tarsi: 51. Middle toe including the 10-mm. long claw: 54 mm.

I repeatedly observed the species as single individuals in the parts of the sea which I particularly traversed, sometimes also in the company of their smaller relatives, among whom it was the rarest. These birds behaved themselves more clumsily and slowly than the others, and never came near the boat so curiously. I could not kill a specimen and never saw one in the hunting catch of the Eskimos.

Near the bird-mountain at cape Black Bluff, Resolution island, I observed three of the birds at the same time on July 25th, and it is possible that these birds had their breeding places on the flat islands of the coast, which are heavily laden with heather growths, or even farther in the hinterland, on freshwater ponds. Kumlien emphasizes the fact that this species occurred at Nugumiut and somewhat north from there on Grinnell bay as a breeding place (1879, p. 94). Yet he had never been there himself and one can depend little on the reports of the natives, who give the same name to all three *Stercorarius* species (p. 319).

Stercorarius parasiticus (L.) (p. 319). *Schmarotzer Raubmöve*.—PARASITIC JAEGER.

Eskimo: *Issungak*, -ak, -at (*partim*).

Abundant visitor on the northeastern Labrador seas, and occasionally breeding bird—for example, on the Eider islands north of Aulatsivik, from whence I saw eggs in the collection of the missionary Perrett.

[p. 320.] Two old (breeding) birds of my collection, male and female, from the region of Killinek, August, 1906, showed the following measurements in the flesh: Weight: 350, 450 grammes. Total length: 460, 500 mm. Spread of wing: 1090, 1100. Wings: 335, 329. Tail: 202 (the middle feathers 47 mm. longer than the next shorter feathers), 222 (69). Tail+wing: 10; 40. Bill: 32, 34. Tarsi: 40, 42. Middle toe including the 8.5 mm. long claw: 44 mm. Iris: dark brown-gray. Bill: blackish at the tip; upper mandible yellowish-gray at the base; lower mandible reddish-gray. Feet: black (in one specimen a one-sided little white spot at the base of the web). One stomach contained fish remains, a mollusc tongue, and cephalopod remains; the other was empty.

This was the most abundant of the jaegers during the period of my observation, but I met with it only on the sea, never in the interior of the land. I saw rather large flocks as early as August 12th, at least 20 to 30 individuals, moving about over Ungava bay, and among them apparently several *S. longicaudus*. By throwing pieces of paper, I lured some of the birds close to the boat. Here they wavered over us with sparkling eyes and called out their cat-like *Gau gau gau*.

I collected the above-mentioned specimens, which showed very much developed genitals. The skill of the jaegers in turning and even tumbling over in the air quick as lightning, is remarkable. This, in addition to their more or less dark colouring, makes them recognizable even from a distance. Their flight is seldom as regular as that of the gulls; at least they fall backward and forward in their juggling about and turning around by fits and starts. This is necessary in order to wrest the booty from the other birds, especially the Kittiwakes. Their flesh is much relished; before cooking, the Eskimos pluck off the feathers.

Stercorarius longicaudus (Vieill.), (p. 320).
Kleine Raubmöve.—LONG-TAILED JAEGER.

Eskimo: *Issungak*, -ak, -at (*partim*).

Rather frequent visitor of our district and probably also occasional breeding bird. Whether the egg collected by J. Ford in 1869 at George river, somewhat south of my district of observation in Ungava bay, and mentioned by Macoun (I, p. 30), actually belongs to this species or to the species previously mentioned, must remain

undecided, just as the genuineness of the other three eggs which Eufrig got from the Eskimos at Cape Chidley in 1903 (1905, p. 235). Turner, to be sure, met the birds at the beginning of July in Ungava bay, without being able to determine their breeding at that place (1886, p. 252).

The only Labrador skin in my collection, a male, belonging pretty certainly to this species in the first juvenile plumage, from Ungava bay, killed on October 2, 1906, shows the following measurements: Wing: 229 mm. (p. 321). Tail: 150, middle feathers exceed the next shorter ones by only 16 mm. Bill: 30, Tarsi: 39. Middle toe, including the 6 mm. long claw, 39 mm.

Even during my passage out in the neighbourhood of Labrador certain specimens of the Long-tailed Jaegers were seen close by the ship, tossing about at times a few metres above us. On my later travels I also observed them not infre-

quently, without being able to shoot a specimen. On September 4th I saw a typical bird in the possession of an Eskimo woman at Killinek, when I was just on the point of starting out on a rather long excursion. I therefore refrained from securing the rather badly shot specimen, but did not get one later. In the open and also in the case of young individuals one must, as is well known, be very careful in the determination of this species in connection with *S. parasiticus*. In its habits *S. longicaudus* resembles its larger relative to an extraordinary degree, but is even more lively, more restless, and more ready for flight. The long tail-feathers of old birds, which in every motion of flight bend elastically, are not only the sure means of recognition, but also an elegant adornment for the species.

(To be continued)

THE FOOD OF THE RED FOX (*Vulpes fulva fulva*)

By JOHN EDMONDS*



HE FOX is one of the commonest fur-bearing mammals of Ontario, being found constantly in settled districts as well as farther north. It is only occasionally that those interested in more than the fur of the animal come into possession of material to make other studies, and as a consequence such items as the food of foxes are seldom made a subject of investigation.

On January 8th, 1928, a fully grown male Red Fox was collected in the swamp of the Holland river, near Pottageville, York county, Ontario, by Messrs. J. L. Baillie, Jr., and Stuart Thompson. The specimen was brought to the Royal Ontario Museum of Zoology, where the writer had an opportunity to make a detailed examination of the alimentary tract. I submit the data for what it is worth, realizing that the contents of the stomach and intestines of one fox contributes only a small amount of information on the food of this animal.

The amount of animal matter in the active alimentary tract was approximately 99%. The stomach contained mostly hair and bones, very little flesh, the latter having passed on to the small intestine. The mass which was found in the stomach was made up of the following items:

1. Feet of a cottontail rabbit (*Sylvilagus floridanus mearnsii*) (bones, hair and some flesh).
2. Bones and skin of four meadow mice (*Microtus pennsylvanicus pennsylvanicus*).
3. The feet and gizzard of one domestic fowl.
4. A few dry grass blades.
5. Two small gravels.

The last two items were probably contained in the fowl gizzard or were otherwise accidentally swallowed by the fox.

As suggested above, the small intestines contained more flesh than did the stomach, but bones and hair were also present. Most of this mass was unidentifiable except for the hair of both rabbit and meadow mice.

In the colon the fecal matter was noticeably drier and composed entirely of material such as hair and bones. Various-sized hair-masses were present, the length of these masses seeming to be controlled by the length of the bones contained therein. Some of these bones were sharp slivers of heavy bones which had not noticeably lost their acute shape by the action of the digestive juices. The hair provided a natural protection against injury to the intestinal wall by abrasion of these sharp pieces.

The animal was killed about 2 p.m. and was sleeping at the time of being discovered. This seems to indicate that the hunger urge had quieted for the time being.

Both cottontails and meadow mice are common mammals of King township and doubtless furnish a plentiful food supply to the few foxes still to be found there. Foxes are certainly not numerous enough to be a serious menace to poultry raising and in the case of remains of fowl, listed above, these may have been picked up from kitchen refuse. This idea was strengthened by the fact that no feathers were found in the alimentary tract.

*As read before the Brodie Club, Toronto.

THE PRESENT RANGE OF THE EUROPEAN HARE IN ONTARIO

By J. R. DYMOND

(Royal Ontario Museum of Zoology, Toronto).



HE EUROPEAN HARE (*Lepus europæus*) introduced into Ontario at Brantford in 1912 (Dymond, 1922; Anderson, 1923) is continuing to extend its range.

Recent inquiries conducted through the co-operation of the District Representatives of the Ontario Department of Agriculture and others show that this species now extends into Kent (at Highgate) on the southwest, Bruce (at Walkerton) and Grey (at Flesherton) on the northwest, Simcoe (at Tottenham) on the north, and Ontario county (at Markham and Uxbridge) on the east. They are naturally commonest near the centre of introduction and in the counties of Oxford, Middlesex and elsewhere afford considerable sport in an area where previously the cotton-tail rabbit was almost the only game animal (Howitt, 1925).

In some districts organized hunts are conducted throughout the winter, with the twofold object of sport and of keeping the species within reasonable limits numerically. Roger Hedley of Ilderton (Middlesex county), Ont., says that up to February 7th, 300 of these hares had been killed in an area of six square miles during the present winter and that many still remained. Later he reported that on February 18th seven men hunting over an area of a little more than one square mile had killed 10 hares and had seen 80 others. Mr. G. R. Green, Agricultural Representative of the Ontario Department of Agriculture in Oxford county reported that in East Nissouri township in organized hunts which are held each Thursday throughout the winter, 218 European hares had been killed by the end of December and that 86 had been killed in the last drive. Similar hunts are carried out in many localities in the counties surrounding the area of original introduction.

This hare does not appear to have become seriously injurious to crops in Ontario as yet.

The injury most commonly reported is that to fall wheat. They are said sometimes to eat off the plants in patches varying in size from one to several square feet. Less often they are accused of girdling young fruit trees and in Welland they are said to be destructive at times to market garden crops. On the whole surprisingly few complaints are heard against these hares on the ground of their destructiveness.

The same species occurs in the eastern United States where it was liberated on a number of occasions, one at least as early as 1888. There it has proved to be seriously injurious at times to young orchard trees. Silver (1924) reports that every tree in one orchard of 200 large 5-year-old apple trees had been badly damaged, and it was estimated that the losses in Dutchess county alone during the winter of 1915-16 exceeded \$100,000.

The European hare is a much larger animal than either our native hare or the cotton-tail rabbit, at times reaching a weight of twelve pounds or even more. Many regard them very highly as food. On account of their size and numbers the amount of meat represented by this hare in Ontario is considerable. Many of the animals killed in Ontario are eaten or sold in the towns and cities. Some are fed to poultry and foxes, but many are said to be left in the fields where they are killed. If there is a market for them it is a shame to permit any to be wasted.

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A PRELIMINARY REPORT ON THE FISHES OF THE HUDSON BAY DRAINAGE SYSTEM

By ALEXANDER BAJKOV

(Biological Board of Canada, University of Manitoba)

VERY LITTLE faunal work has been done in this drainage area and no list of the fishes occurring in the Hudson Bay system has ever been printed. As far as we know, the freshwater fish of the Hudson Bay drainage system comprise about a hundred species and subspecies.

The species and genera can be classified as follows

FAMILIES	GENERA	SPECIES
Petromyzontidæ.....	2	3
Acipenseridæ.....	1	3
Amidæ.....	1	1
Siluridæ.....	4	6
Catostomidæ.....	5	12
Cyprinidæ.....	11	24
Hiodontidæ.....	1	3
Coregonidæ.....	2	7 (9)
Thymallidæ.....	1	1
Salmonidæ.....	2 (3)	2 (4)
Esocidæ.....	1	3
Gasterosteidæ.....	3	3
Percopsidæ.....	1	1
Centrarchidæ.....	3	4
Serranidæ.....	1	1
Percidæ.....	6	9
Sciænidæ.....	1	1
Cottidæ.....	2	6
Gadidæ.....	1	1

Total: Families, 19; Genera, 49 (50); Species, 91 (95).

The dominant families are the Cyprinidæ (24 species), the Catostomidæ (12 species) and the Percidæ (9 species).

According to its ichthyofauna the Hudson Bay drainage system may be placed as a whole in the circumpolar region but as an independent sub-region, distinct from the neighbouring system of the Mackenzie river, by reason of admixture of southern species which have most probably entered from the Mississippi river system. On the other hand, the Mackenzie river system contains several species of fish which occur in Siberia: *Salvelinus alpinus malma*, *Stenodus mackenzie*, *Coregonus kennicotti*, *Coregonus nasus*, subgenus *Pegedictis*, which do not occur in the Hudson Bay system and on the east by St. Lawrence river system (Atlantic ocean). The drainage of Hudson bay accounts for over one million square miles, including a large part of the northwestern terri-

tories east of Great Slave lake, part of Alberta, nearly all of Saskatchewan, the whole of the province of Manitoba, parts of North Dakota and Minnesota, the northern part of Ontario and the greater part of Quebec.

In this region are situated three very large lakes—Lake Winnipeg (9,460 sq. miles), Lake Winnipegosis (2,068 sq. miles) and Lake Manitoba (1,775 sq. miles), with several smaller, but still large, lakes. These three main lakes, together with the Lake of the Woods and several other lakes and rivers (Red, Winnipeg, Saskatchewan, etc.) represent the system of the Nelson river, which is the biggest river system in the Hudson Bay drainage. Although all these lakes and rivers are included in one system, the fish fauna in different parts of this system is very different.

The richest waters, in number of species, are Lake Winnipeg and the Lake of the Woods, because these waters have received the largest number of fish from other regions. Several species very common in these lakes—e.g. *Acipenser fulvescens*—do not occur in Lakes Manitoba and Winnipegosis. This is true not only of fish but of other aquatic animals; e.g. *Mysis relicta*, which is abundant in Lake Winnipeg, but does not occur in Lake Manitoba or Lake Winnipegosis.

The ichthyofauna of the Hudson Bay system, as of the Arctic region in general, is comparatively very young. During the Ice Age freshwater fish were absent from those parts which were under ice. During that time only certain of the Arctic species survived by migrating southward. Thus the genera *Coregonus*, *Leucichthys*, *Cristivomer* and others appear to have migrated to the south and, after the last Glacial period, extended northward again. At the same time many southern fish—*Ictiobus bubalus*, *Carpoides velifer*, several species of *Moxostoma*, *Ameiurus*, many species of *Cyprinidæ*, etc.—penetrated into the Hudson Bay drainage.

There are, it may be claimed, few endemic species in the Hudson Bay drainage system. Possibly after detailed investigations have been made of the fish of this huge region, which contains the greatest freshwater fisheries in the world, several new species, endemic to the Hudson Bay drainage, will be found.

The Hudson Bay drainage system may possibly be divided into two quite distinct sections: a southern section (Prairie zone) with a strongly dominant mixture of southern forms, and a northern section, where these species are represented by a small percentage or are quite absent. The northern section is characterized by the presence of *Salvelinus fontinalis* and *Thymallus signifer*. The fishes of this northern section are very little known and need further investigation.

Below is a list of species many of which were collected by the writer in 1926 and 1927. The majority of the fish had also been previously reported by other authors from different parts of the Hudson Bay region.

The name *Stizostedion* has been dropped by the author in favour of *Lucioperca* as given by Cuvier in 1817 (Regne Anim. p. 295), the name *Stizostedion* having been given by Rafinesque in 1820.

Those species of which specimens have been examined are indicated by an asterisk.

LIST OF SPECIES

Family Petromyzontidæ

Ichthyomyzon concolor (Kirtland).—Silver Lamprey.

Ichthyomyzon castaneus Girard.—Northern Lamprey.

Lampetra wilderi Gage.—Brook Lamprey.

Family Acipenseridæ

**Acipenser fulvescens* Rafinesque (*A. rubicundus* Le Sueur).—Lake Sturgeon.

Acipenser sturio oxyrhynchus Mitchill.—Common Sturgeon (?)

Acipenser transmontanus Richardson.—White Sturgeon.

Family Amiidæ

Amia calva Linne.—Dogfish.

Family Siluridæ

**Ictalurus punctatus* Rafinesque.—Spotted Catfish.

Ameiurus lacustris Walbaum.—Great Lake Catfish.

**Ameiurus nebulosus* Le Sueur (= *A. vulgaris* Thompson).—Common Bullhead.

**Ameiurus melas* (Rafinesque).—Black Bullhead.

**Noturus flavus* Rafinesque.—Stone Catfish.

Schilbeodes gyrinus (Mitchill).

Family Catostomidæ

**Ictiobus cyprinella* Cuvier and Valenciennes.—Buffalo-fish.

**Ictiobus bubalis* Rafinesque.—Small-mouth Buffalo-fish.

Carpiodes thomsoni Agassiz.—Carp Sucker.

Carpiodes velifer Rafinesque.—Quillback Sucker.

**Moxostoma anisurum* (Rafinesque).—Whitened Red-horse.

**Moxostoma aureolum* Le Sueur.—Red-horse.

**Moxostoma lesueurii* Richardson.—Northern Red-horse.

**Catostomus catostomus* (Forster).—Northern Sucker.

**Catostomus commersonnii* (Lacepede).—Common Sucker.

Catostomus nigricans Le Sueur.—Black Sucker.

Catostomus griseus Girard.—Gray Sucker.

Erimyzon sucetta oblongus Mitchill.—Chub Sucker.

Family Cyprinidæ

Chrosomus erythrogaster Rafinesque.—Red-bellied Dace.

**Notropis blennius* Girard.—Straw-coloured Minnow.

**Notropis hudsonius* De Witt Clinton.—Spot-tail Minnow.

**Notropis hudsonius seline* Starr Jordan.—Spawn-eater.

**Notropis jejunus* Forbes.—Poor Minnow.

**Notropis atherinoides* Rafinesque.—The Great Minnow.

**Notropis cayuga* Meek (*N. heterolepis* Eigen. and Eigen.).—Cayuga Shiner.

Notropis cornutus (Mitchill).—Silverside.

Notropis rubrifrons (Cope).—Rosy-front Minnow.

Notropis umbratilis cyanæcephalus (Copeland).—Red-fin Minnow.

Notropis scopifer Eigenmann and Eigenmann.—Minnow.

**Pimephales promelas* Rafinesque.—Bullhead Minnow.

Pimephales notatus (Rafinesque).—Blunt-nosed Minnow.

Notemigonus crysoleucas Mitchill.—Golden Shiner.

Hybognathus nuchalis Agassiz.—Silver Minnow.

Hybognathus argyritis Girard.—White Minnow.

Hybopsis storerianus Kirtland.—Storer's Minnow.

Hybopsis kentuckiensis (Rafinesque).—River Chub.

Pfrittle neogæus Cope.—Fine-scaled Dace.

Platygobio gracilis Cope.—Flatheaded Chub.

**Margariscus margarita nachtriebi* U. O. Cox.—Nachtrieb's Minnow.

**Rhinichthys cataractæ* Cuvier and Valenciennes.—Long-nosed Dace.

Rhinichthys atronasmus (Mitchill).—Black-nosed Dace.

Couesius plumbeus Agassiz.—Lake Chub.

Family Hiodontidæ

**Hiodon chrysops* Richardson.—Western Gold-eye.

**Hiodon tergisus* Le Sueur.—Moon-eye.

**Hiodon alosoides* Rafinesque.—Shad Moon-eye.

Family Coregonidæ

**Coregonus clupeaformis* (Mitchill).—Common Whitefish.

Coregonus labradoricus Richardson.—Labrador Whitefish. (?)

Coregonus quadrilateralis Richardson.—Round Whitefish.

Coregonus williamsoni Girard.—Rocky Mountain Whitefish.

**Coregonus* sp.

**Leucichthys tullibee* (Richardson).—Tullibee.

**Leucichthys nipigon* Kolez.—Tullibee.

Leucichthys nigripinnis (Gill).—Black-fin. (?)

Leucichthys hoyi (Gill) ?.—Bloater.

**Leucichthys zenithicus* (Jordan and Evermann).—Longjaw.

**Leucichthys artedii* (Le Sueur).—Lake Herring.

Family Thymallidæ

Thymallus signifer (Richardson).

Family Salmonidæ

**Cristivomer namaycush* (Walbaum).—Lake Trout.

**Salvelinus fontinalis* (Mitchill).—Speckled Trout.

Salmo salar Linne (?).

Salmo salar ouananiche McCarthy.—Landlocked Salmon (?).

Family Esocidæ

**Esox lucius* Linne.—Pike. Jackfish.

**Esox masquinongy* Mitchill.—Maskinonge.

Esox americanus.—Banded Pickerel (?).

Family Gasterosteidæ

**Eucalia inconstans* (Kirtland).—Brook Stickleback.

**Pungitius pungitius* Linne.—Nine-spined Stickleback.

Gasterosteus aculeatus Linne.—Common Stickleback.

Family Percopsidæ

Percopsis omisco-maycus Walbaum (= *P. guttatus* Agassiz).—Trout Perch.

Family Centrarchidæ

**Pomoxis sparoides* Lacépède.—Calico Bass.

**Ambloplites rupestris* (Rafinesque).—Rock Bass

Micropterus dolomieu Lacépède.—Small-mouth Black Bass.

Micropterus salmoides Lacépède.—Large-mouth Black Bass.

Family Serranidæ

Roccus chrysops (Rafinesque).—White Bass.

Family Percidæ

**Lucioperca (Stizostedion) vitreum* (Mitchill).—Pike-perch. Pickerel.

**Lucioperca (Stizostedion) canadense* (Smitt).—Sauger. Sand Pike.

Lucioperca (Stizostedion) canadense griseum De Ray—Sauger.

**Perca flavescens* (Mitchill).—Yellow Perch.

Percina carpodes zebra (Agassiz).

Hadropterus aspro Cope and Jordan.—Black-sided Darter.

Hadropterus gunteri (Eigenmann and Eigenmann).—Günther's Darter.

**Boleosoma nigrum* Rafinesque.—Johnny Darter

Pæcilichthys exilis Girard (= *Etheostoma icwæ* Jordan and Meek)—Iowa Darter.

Family Sciaenidæ

Aplodinotus grunniens Rafinesque.

Family Cottidæ

Cottus bairdii Girard—Miller's thumb.

Cottus pollicaris Jordan and Gilbert.—Olivaceous Miller's thumb.

**Cottus cognatus* Richardson.—Miller's thumb.

Cottus onychus Eigenmann and Eigenmann (= *C. ricei* Nelson).—Rice Sculpin.

Cottus spilotos Cope.

Trigloopsis thomsoni Girard.—Lake Sculpin.

Family Gadidæ

**Lota lota maculosa* Le Sueur.—Ling.

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NOTES ON MARINE ALGÆ COLLECTED AT DEPARTURE BAY, B.C.

By ROBERT CONNELL



THE FOLLOWING NOTES on the marine algæ collected by me in the immediate neighbourhood of the Pacific Biological Station at Departure bay are the result of visits made to the Station on three occasions during the years 1924, 1925 and 1926, in the months of July, August and April respectively, when every facility possible for the purpose of making a general survey of the marine flora in the short time at my disposal on each visit was kindly given me by Dr. Clemens.

The Station stands upon glacial deposits which in turn rest upon a narrow strip of fossiliferous Cretaceous sandstone and conglomerate fringing the adesite of the Vancouver group. Below the Station is a flat of sandy mud exposed at low tide. Almost up to the very upper verge of high water little tufts of *Gigartina papillata* grow, attaining by far the highest limit of any of the "reds". Their habitat is the rough surface of the sandstone. To the east, where rock-ledges thrust themselves into the sea and thus form the boundary of the sand-flat on that side, there is a luxurious growth of *Fucus evanescens* with *F. edentatus* f. *divaricatus*. The densest growth of the former I found on a piece of timber lying across a small creek which during the winter and spring must appreciably reduce the salinity of the water at this point. The rocks contain no pools except recesses caused by fracture, and these are small. In them grows a species of *Odonthalia*, a small, stunted form probably *O. floccosa*. About halfway between tide-marks *Ulva lactuca* f. *latisima* begins and, as it passes downward below low-water mark, it increases conspicuously in size and abundance. With it grows *Porphyra perforata*, the "seaweed" of the Chinese gatherers who dry large quantities along the coast of Vancouver island for their own markets. All over the flat are scattered clumps of *Ceramium rubrum pacificum*, extending well above low-water mark. In April I found young plants of *Nereocystis Lutkeana* growing just below the lowest water, and showing at that time very plainly

the characteristic fission of the sporophyll blades. Among the floating algæ washed in by the tides were *Laminaria bullata* and *Costaria costata*, neither of which did I see growing.

The northeast corner of Departure bay is at the entrance to Horswell channel which runs between the main shore and the island groups of the West Rocks and the Five Fingers. The latter is the more distant and is about one and a half miles from the nearest point on the shore, Lagoon head. The channel is the most northerly of three openings through which the tides sweep in and out from Northumberland channel between Vancouver island and Gabriola island. In consequence of the strong current in Horswell channel, and the deep water, there is a rich growth of certain kinds of algæ. Of these the red ones or *Rhodophyceæ* are quite predominant, so far as my observation goes. Conspicuous are the great fronds of *Gigartina exasperata*, with which are associated on the bottom, from one to three feet below the lowest tide in the narrow channel between the reefs and the main shore, such forms as *Agardhiella tenera*, *Gracilaria confervoides*, *Farlowia mollis*, and *Prionitis lyallii*, while higher on the adjacent rocks grow *Odonthalia aleutica*, *Pelvetia fastigiata*, and *Laurencia pinnatifida*. There is the usual abundance of *Fucus evanescens* on the reefs between tide-marks, and below the lowest tide-mark grows *Costaria costata*.

About a mile to the north lies Hammond bay at the southern extremity of which is Page lagoon, separated from the outer waters by a low wall of rock terminating at the north in the bold irregular mass of Lagoon head. Page lagoon is particularly rich in a few species of "reds": *Rhodomela larix*, *Ceramium rubrum* v. *pacificum* and *Gigartina exasperata*, but in the months of my visits to it, July and August, the fronds were much bleached. *Prionitis lyallii* is also common and suffers in the same way in summer. *Poly-siphonia urceolata*, *P. nigrescens affinis*, and *P. subulata*, are also found, the last growing on small worm-tubes, the habitat also of the rarer

Heterosiphonia sp. *Pterisiphonia bipinnata*, and *P. parasitica*. Still rarer "reds" are *Platythamnion heteromorpha*, *Griffithsia schousboei*, and *Dasyopsis plumosa*, the last in one observed case acting as host to the first.

I have to thank Drs. Setchell and Gardner of the University of California for their unfailing kindness in the naming of algæ sent them for identification.

MARINE ALGÆ AT DEPARTURE BAY ASSIGNED TO STATIONS

BIOLOGICAL STATION:

Chlorophyceæ:

Ulva lactuca f. *latissima* (L.) DC.

Phæophyceæ:

Fucus evanescens f. *robustus* S. & G.

Fucus edentatus f. *divaricatus* Gardner.

Nereocystis luteana P. & R.

Rhodophyceæ:

Porphyra perforata J. Ag.

Gigartina papillata (Ag.) J. Ag.

Odonthalia floccosa ? (Esper) Falkenberg.

Ceramium rubrum var. *pacificum* Collins.

Pterosiphonia bipinnata (P. & R.) Falkenberg.

Constantinea subulifera Setchell.

HORSWELL CHANNEL.

Melanophyceæ:

Fucus evanescens f. *robustus* S. & G.

Fucus edentatus f. *divaricatus* Gardner.

Pelvetia fastigiata Decne.

Costaria costata (Turn.) Saunders.

Desmarestia intermedia P. & R.

Nereocystis luteana P. & R.

Rhodophyceæ:

Gigartina exasperata Harvey & Bailey.

Gigartina papillata (Ag.) J. Ag.

Aghardhiella tenera (J. Ag.) Schmitz.

Gracilaria confervoides (L.) Greville.

Laurencia pinnatifida (Gmel.) Lamouroux.

Odonthalia aleutica (Ag.) J. Ag.

Prionitis lyallii Harvey.

Farlowia mollis (H. & B.) Farlow & Setchell.

Ceramium rubrum var. *pacificum* Collins.

Rhodomela larix (Turn.) J. Ag.

Iridea laminaroides Bory.

Nitophyllum sp.

Rhodymenia pertusa (P. & R.) J. Ag.

Rhodymenia palmata (L.) Greville.

Porphyra perforata J. Ag.

PAGE LAGOON.

Melanophyceæ:

Coilodesme californica (Rupr.) Kjellm.

Rhodophyceæ:

Gelidium amansii Lamouroux.

Gigartina exasperata Harvey & Bailey.

Rhodomela larix (Turn.) J. Ag.

Dasyopsis plumosa (H. & B.) Falkenberg.

Griffithsia schousboei Montagne.

Platythamnion heteromorphum J. Ag.

Ceramium rubrum var. *pacificum* Collins.

Ceramium rubrum f. *radians* Petersen.

Ceramium rubrum f. *strictum* Harvey.

Prionitis lyallii Harvey.

Polysiphonia urceolata (Lightf.) Greville.

Polysiphonia nigrescens (Huds.) Greville var. *affinis* (Moore) Harvey.

Polysiphonia subulata (Ducl.) J. Ag.

Pterisiphonia bipinnata (P. & R.) Falkenberg.

Pterisiphonia parasitica (Huds.) Falkenberg.

Heterosiphonia sp.

FOUND FLOATING:

Melanophyceæ:

Laminaria bullata Kjellmann.

In addition to the above Miss Dorothy E. Newton, during the summer of 1927, collected some additional species. These are listed below with her consent. The identifications have been confirmed by Dr. N. L. Gardner, to whom Miss Newton wishes to make grateful acknowledgment.

Rhodophyceæ:

Corytonemina obovata J. Ag.

Gelidium sp.

Gigartina mamillosa (Goodenough & Woodward) J. Ag.

Plocamium pacificum Kylin.

Prionitis lyallii f. *densissima* Harvey.

Iridaea cordata J. Ag.

(all in the vicinity of the Biological Station.)

Phæophyceæ:

Fucus evanescens f. *macrocephalus* Kjellm. Departure bay.

Fucus furcatus f. *rigidus* Gardner. Horsewell channel.

Fucus furcatus f. *variabilis* Gardner. Campbell river.

Fucus membranaceus f. *limitatus* Gardner. Horsewell reef.

CANADIAN CHRISTMAS BIRD CENSUS, 1927

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ALBERTA

CAMROSE, December 22nd.—10 a.m. to 3.30 p.m., Camrose to Battle River by train, 6 miles, then six miles on foot. Observers together. Fine, no wind. Zero at start, 10 above at finish. One foot snow. Ruffed Grouse, 1; Great Horned Owl, 2; Downy Woodpecker, 2; Blue Jay, 4; Magpie, 5; Pine Grosbeak, 40; Redpoll, 25; Snow Flake, 10; Brown Creeper, 12; Long-tailed Chickadee, 20; Hudsonian Chickadee, 10. Total: 11 species; 131 individuals.

Fresh tracks of the day seen of Hungarian Partridge and Sharp-tailed Grouse. A lone Rusty Blackbird has wintered so far at a farmer's near where this trip was made. Temperature has been to 40 below zero.—F. L. FARLEY, T. E. RANDALL and ARTHUR TWOMEY.

GLENEVIS, December 18th, 1927.—9 a.m. to 6 p.m. About 10 miles on skis. Temperature 30° above zero, about 15 inches of snow, wind from S.W., overcast. Through open country and thick timber.

American Hawk Owl, 1; Ruffed Grouse, 1; Sharp-tailed Grouse, 3; Hairy Woodpecker, 4; Downy Woodpecker, 3; American Three-toed Woodpecker, 1; Magpie, 1; Blue Jay, 1; Canada Jay, 5; Pine Grosbeak, 1; Redpoll, 20; Snow Bunting, 10; Brown Creeper, 6; Black-capped Chickadee, 21; Hudsonian Chickadee, 3. Total: 15 species; about 75 individuals.

Additional species seen from December 18 to 25: Evening Grosbeak, 11; Crossbill (species doubtful), about 5. A Tree Sparrow came around the yard on November 22, 23 and 24. It had evidently had a broken wing as one was misshapen. Birds of prey very rare this winter, owing probably to scarcity of rabbits.—FRED. H. PEGG.

BRITISH COLUMBIA

COMOX BAY, VANCOUVER ISLAND, Goose Spit, thence by shore via Hawkins Point to near Cape Lazo. Return via woods trail. Observer on foot.

December 20th, 1927, 11 a.m. to 4 p.m. Day warm, sunny, calm.

Western Grebe, 50; Holboell's Grebe, 8; Horned Grebe, 16; Loon, 11; Red-throated Loon,

4; Marbled Murrelet, 31; Pigeon Guillemot, 4; Cal. Murre, 56; Glaucous-winged Gull, 70; Herring Gull, 1; Short-billed Gull, 3; Violet Green Cormorant, 3; Red-breasted Merganser, 3; Hooded Merganser, 2; Mallard, 50; Widgeon, 40; Canvas-back Duck, 40; Great Scaup, 208; American Golden eye, 90; Harlequin, 37; Old Squaw, 5; American Scoter, 66; White-winged Scoter, 630; Surf Scoter, 91; Black Brant, 10; Blue Heron, 3; Red-backed Sandpiper, 15; Killdeer, 4; Black Turnstone, 12; California Quail, 100; Oregon Ruffed Grouse, 2; Ring-necked Pheasant, 3; Kingfisher, 5; Harris Woodpecker, 4; Gairdner Woodpecker, 4; Red-breasted Sapsucker, 1; Flicker, 4; Pileated Woodpecker, 1; Steller Jay, 3; Crow, 7; Meadow Lark, 1; Pine Siskin, 100; Nuttall's Sparrow, 1; Oregon Junco, 12; Rusty Song Sparrow, 12; Fox Sparrow, 10; Oregon Towhee, 21; Seattle Wren, 4; Winter Wren, 13; Oregon Chickadee, 3; Golden-crowned Kinglet, 4; Robin, 1; Varied Thrush, 12; Total: 58 species; 1,863 individuals.—H. M. LAING, Comox.

MANITOBA

EAST BAY, December 23rd.—Bright, no wind. Temperature 1° to 20°. Around farm in morning. Ruffed Grouse, 1; Hairy Woodpecker, 1; Pine Grosbeak, 2; Snow Bunting, 20; Northern Shrike, 1; Black-capped Chickadee, 3. Total: 6 species; 28 individuals.—EDWARD ROBINSON.

MOUNTAINSIDE, December 26.—Hairy Woodpecker, 2; Downy Woodpecker, 2; Blue Jay, 3; Pine Grosbeak, 12; Snow Bunting, several hundred; Bohemian Waxwing, 40 to 50; White-breasted Nuthatch, 2; Black-capped Chickadee, 4. Totals: 8 species; 65+ individuals.

ST. MARTIN, December 20.—Six groups of pupils of Karpaty School covered a distance of 35 miles. Temperature 20 degrees, fine, clear sky, no wind; foot of snow on ground. Ruffed Grouse, 17; Sharp-tailed Grouse, 18; Hairy Woodpecker, 10; Downy Woodpecker, 2; Canada Jay, 2; Blue Jay, 6; Pine Grosbeak, 89; Evening Grosbeak, 7; Redpoll, 90; Snow Bunting, 157; Northern Shrike, 1; Black-capped Chickadee, 34. Totals: 12 species, 433 birds.—VICTOR WOYNA, Teacher.

WINNIPEG: Fort Garry, Agricultural College, Winnipeg, St. James, Sturgeon Creek, North Kildonan, East Kildonan. December 18.—Temperature, 6 degrees below zero, northwest wind of 8 miles velocity, six inches of snow. Three field parties and four feeding stations. Goshawk, 1; Ruffed Grouse, 2; Hairy Woodpecker, 3; Downy Woodpecker, 6; Blue Jay, 23; Pine Grosbeak, 30; Purple Finch, 1; Snow Bunting, 7; White-breasted Nuthatch, 16; Black-capped Chickadee, 20. Totals: 10 species; 109 birds.

Birds much scarcer this winter, probably owing to early severe weather. The 1926 census showed 18 species, 214 birds; and the 1925 census, 14 species, 412 birds—these totals excluding Snow Buntings which were seen in an area not covered this winter. The Purple Finch was positively identified and is the first recorded in winter for this locality.—MRS. C. P. ANDERSON, C. L. BROLEY, B. W. CARTWRIGHT, G. CHAMPION, G. DEWAR, A. G. LAWRENCE, N. LOWE, DR. T. H. MCCARTHY, A. A. MCCOUBREY, JR., J. R. MORTON, H. C. PEARCE.

NORTHWEST TERRITORIES

BAKER LAKE, December 25 (?).—Sunrise, 10 a.m., to sunset, 3 p.m. approximately. Fine; no wind; temperature -28° . Twelve miles on foot, northwesterly from end of Baker Lake, crossing the Thelon river at its mouth, over top of a hill, about the highest near lake shore. Ptarmigan, 5. Total: 1 species, 5 individuals.—W. O. DOUGLAS.

This census, probably the most northerly Christmas Bird Census for the continent in 1927, was requested a year ago. Mr. Douglas, in reporting it, mentioned that he saw 2 Arctic Hares in the course of his census walk, both the Hares and the Ptarmigan were at the foot of the hill which he passed over. On the west side of the lake, where willows are more plentiful, large flocks of Ptarmigan have been seen all winter. Mr. Douglas's census report was dated at Baker Lake, January 20, 1928, and reached Ottawa on April 16th.—H. L.

ONTARIO

ARNPRIOR, December 25, 1927.—9 a.m. to 5 p.m. Clear; 6 inches of snow; wind, northwest, light; temperature 0° at start, 14° at return. Distance covered eighteen miles on foot, one observer travelling southeast from Arnprior through Nopiming Sanctuary to Marshall Bay and return, the other working northwest from Arnprior through McLachlin Grove and along

the shore of Lac des Chats to Braeside, returning about a mile inland.

American Golden-eye, 2; Canada Ruffed Grouse, 5; Northern Hairy Woodpecker, 5; Northern Downy Woodpecker, 5; Arctic Three-toed Woodpecker, 1; American Three-toed Woodpecker, 1; Blue Jay, 2; European Starling, 5; Evening Grosbeak, 18; White-winged Crossbill, 16; Redpoll, 10+; Snow Bunting, 10; English Sparrow, 1+; Song Sparrow, 1; Northern Shrike, 1; Brown Creeper, 4; White-breasted Nuthatch, 9; Black-capped Chickadee, 60; Golden-crowned Kinglet, 3. Total: 19 species; 159+ individuals.

The most interesting records contained in the above list are the two species of Three-toed Woodpeckers, the Song Sparrow and the Golden-crowned Kinglet. The American Three-toed Woodpecker, an adult male, was found about noon, diligently working on some dead spruce boughs. He was very tame and allowed so close an approach that, without the aid of glasses, the observer was able to discern the small white larvæ as he chiselled them out of the wood. On the same date last year and working over the same tree a female of this species was found. The Arctic Three-toed Woodpecker, of which our records are much more numerous than for the American, was found early in the afternoon, also working on a dead spruce. This bird was also an adult male. The Northern Pileated Woodpecker, included in our list last year, was not observed to-day, nor did we find any evidence of its presence.

Winter records of the Song Sparrow at Arnprior are sufficiently rare to be worthy of record. The single bird found to-day was tailless, which, perhaps, made it impossible for him to journey south. Winter records of the Golden-crowned Kinglet are also noteworthy. We believe that few winter here every year, but as they always travel with the Chickadees, keep to the cedar swamps, and are easily overlooked. The three observed to-day were found in a cedar swamp near Braeside, where the writer found a pair nesting a few years ago. As last year, the Red-breasted Nuthatch is absent from this district.

The above is our fifteenth consecutive census, each year practically the same route being followed and the same territory covered.—LIGUORI GORMLEY and CHARLES MACNAMARA.

BRANTFORD, January 1.—Raw and blustery. Two parties. First party, 2 p.m. to 5 p.m. Southeasterly from city limits along west bank of Grand river to about one-half mile below "Bell

Homestead", circling westerly and re-entering city from Burford road. Downy Woodpecker, 1; English Sparrow, 500 (about); Tree Sparrow, 5; Song Sparrow, 1; Snow Bunting, 58 (about); Junco, 5; Cardinal, 2 (1 pair); Cedar Waxwing, 5; Brown Creeper, 4; White-breasted Nuthatch, 3; Black-capped Chickadee, 21; Golden-crowned Kinglet, 6. Total: 12 species; 611 individuals.

Second party, 8 a.m. to 12 noon. Through Ontario School for the Blind grounds to the north-east bank of Grand river, up river to Hardy's, skirted marsh and through Hardy's bush and Nightingale's Swamp, crossed C.N.R. tracks and across country to St. George road, circling south-east and re-entering city at North Parks street. Herring Gull, 3; American Merganser, 1; Screech Owl, 1; Hairy Woodpecker, 1; Downy Woodpecker, 3; Crow, 100 (about); Blue Jay, 4; Starling, 7; Redpoll, 40 (about); Snow Bunting, 150 (about); Tree Sparrow, 28; English Sparrow, 75 (about); Junco, 37 (about); Cedar Waxwing, 11; Brown Creeper, 1; White-breasted Nuthatch, 2; Black-capped Chickadee, 50 (about). Total: 17 species; 514 individuals. Total for two parties: 20 species; 1125 individuals.—H. FULCHER, H. HARRISON, and MR. and MRS. W. G. NEFF.

GUELPH, January 2.—Cold, bright sunshine, fair wind, snow flurries in p.m., temperature 3° to 15°, about 2 inches snow on ground. 9.45 a.m. to 12.30 p.m. Through fields and woods to the east and north of city. 2.45 p.m. to 5.15 p.m. South along the east bank of the Speed river to Hanlan creek and return. Total about 8 miles on foot. Ruffed Grouse, 2; Belted Kingfisher, 1; Hairy Woodpecker, 1; Junco, 12; Brown Creeper, 1; Golden-crowned Kinglet, 2; White-breasted Nuthatch, 1. Total: 7 species; 20 individuals.—ROBERT E. BARBER.

HAMILTON, December 27.—9 a.m. to 5 p.m. Mild, no snow. Six parties.

The area covered was along the face of the mountain—above and below—and in the open gardens and parks of the city and the wooded section to the west of the city limits with the shores and adjoining regions of the Dundas marsh (part of the Dundas Marsh Bird Game Preserve), also the open fields and waste lands and the shoreline where there was open water along the north shore of the bay as far east as the open water of lake Ontario at Burlington. The birds seen were as follows: Glaucous Gulls, 6; Great Black-backed

Gull, 1; Herring Gull, 404+ (400 plus, 2 plus 2); American Merganser, 3; Black Duck, 225+; American Golden-eye, 40+; Ruffed Grouse, 3; Pheasant, 4; Sparrow Hawk, 1; Hairy Woodpecker, 9; Downy Woodpecker, 20; Canada Jay, 1; Starlings, 509 (500+ plus, 5, 4); Meadowlarks, 5; Tree Sparrows, 19; Slate-coloured Junco, 13; Song Sparrow (?), 1; Mockingbird, 1; White-breasted Nuthatch, 15; Chickadee, 76; Robin, 2. A total of 21 species and 1,358 individuals. Since this census was taken, large flocks of Snow Bunting (1,000+) in flocks of 200, 300, and so on have been observed, and also 60 to 75 Horned Larks.—HAMILTON BIRD PROTECTION SOCIETY, Reported by CECIL D. COOK, *President*.

KINGSTON, December 26.—1 p.m. to 4.30 p.m. Clear. Four inches snow; calm; temperature, 34° at start, 32° at return. About fifteen miles in auto and on foot. Small inlets, marshes and creeks skimmed over with ice. Observer alone.

Glaucous Gull, 2; Herring Gull, 26; Ring-billed Gull, 7; American Merganser, 1; Black Duck, 4; Golden-eye Duck, 22; Goshawk, 1; Great Horned Owl, 1; Hairy Woodpecker, 2; Downy Woodpecker, 3; Arctic Three-toed Woodpecker, 1; Crows, 200 (estimated); English Starlings, 250 (estimated); Meadowlark, 1; Bronzed Grackle, 6; Evening Grosbeak, 15; Redpoll, 14; White-breasted Nuthatch, 3; Chickadee, 7. Total: 21 species; about 500 individuals.—EDWIN BEAUPRE.

LONDON AREA, December 24th, 1927.—Combined list of six parties working independently three in the a.m. and three in the p.m., practically from daylight until dark. Temperature 19° at 8 a.m., 24° at 2 p.m. and 22° at 5 p.m. Sky overcast, about 6 inches of snow, wind northeast but very light.

Herring Gull, 3; American Merganser, 11; Golden-eye, 7; Quail, fresh tracks of a bevy of 20 which had been feeding at a farm house but which had gone just before our observers arrived; Grouse, 2; also the remains of one that had been freshly killed; Pheasant, 11; Sharpshin Hawk, 1; Cooper's Hawk, 1; Red-tailed Hawk, 1; Hawk (sp. ?), 2; Screech Owl, 3; Great Horned Owl, 2; Kingfisher, 1; Hairy Woodpecker, 9; Downy Woodpecker, 26; Flicker, 1; Bluejay, 21; Crow, 226; Purple Finch, 4; Redpoll, 14; Goldfinch, 2; Snow Bunting, 505 (two flocks aggregating about 500 plus a smaller flock of five); Tree Sparrow, 131; Junco, 28; Song Sparrow, 4; Cardinal, 23 (very numerous, one flock of 9); Catbird, 1

(feeding on suet at J. C. Middleton's. First winter record); Brown Creeper, 3; White-breasted Nuthatch, 38; Black-capped Chickadee, 113; Golden-crowned Kinglet, 18; Robin, 1; English Sparrow, hundreds. Total: 32 species (including English Sparrows) plus two unidentified Hawks which may or may not have been the same as those we did identify definitely. Total, 1,234 individuals, plus English Sparrows.—MCLWRAITH ORNITHOLOGICAL CLUB, per J. F. CALVERT, MR. and MRS. E. M. S. DALE, ELI DAVIS, W. E. SAUNDERS, MR. and MRS. E. H. MCKONE, TOM WILLIS, R. T. HEDLEY.

OTTAWA, December 26, 1927.—Cloudiness 25 per cent; 8 in. of snow; wind variable and very light; temperature 18° at 8.30 a.m. and at 4 p.m. Eight separate parties, observing chiefly on foot. First party, 10.30 a.m. to 1.30 p.m., vicinity of Rockcliffe Park, 10 miles; second party, 9 a.m. to 3.45 p.m., south from Dow's Swamp along Canadian Pacific Railway, returning by Metcalfe Road, 10 miles; third party, 8.30 a.m. to 4 p.m., Experimental Farm via Rideau Canal to Black Rapids and return, 15 miles; fourth party, vicinity of Hog's Back all day; fifth party, 11.30 a.m. to 4 p.m., Mechanicsville to Britannia, 6 miles; sixth party, 8 a.m. to 5 p.m., Ottawa to Breckenridge, Que., by train, 17 miles, Breckenridge toward Ottawa through Aylmer and Deschenes, 16 miles on foot; seventh party, 7.20 a.m. to 4.30 p.m., Rockcliffe Park, Ottawa, Hull, Ironsides, Farmer's Rapids and vicinity, and return, 3 miles by street car, 12 by bus, 12 on foot; eighth party, 9 a.m. to 4.30 p.m., eastward from Gatineau Point and return, 12 miles on foot.

American Merganser, 1; Merganser (sp. ?, probably also American), 3; American Golden-eye, 50; Canada Ruffed Grouse, 7; Large Owl (sp. ?), 1; Hairy Woodpecker, 9; Downy Woodpecker, 8; Arctic Three-toed Woodpecker, 1; Blue Jay, 10; Crow, 435; Starling, 210; Pine Grosbeak, 2; White-winged Crossbill, 11; Redpoll, 73; Pine Siskin, 71; Snow Bunting, 18; Tree Sparrow, 8; Song Sparrow, 2; Northern Shrike, 2; White-breasted Nuthatch, 9; Black-capped Chickadee, 194; Hudsonian Chickadee, 1; Golden-crowned Kinglet, 9. Total: 22 species; 1,135 individuals. Also European House Sparrow, 1,075.—D. BLAKELY, D. B. DELURY, R. E. DELURY, B. A. FAUVEL, C. E. JOHNSON, ALICE LANCELY, W. H. LANCELY, HARRISON F. LEWIS, HOYES LLOYD, WILMOT LLOYD, R. D. LOCKWOOD, F. H. OSTROM, C. M. STERNBERG, RAYMOND STERNBERG, HARLOW WRIGHT (*Ottawa Field-Naturalists' Club*).

Owing in part, no doubt, to the comparatively mild autumn, the number of species seen, 23 (inclusive of House Sparrows and Starling), was large, as also the total number of birds seen, 2,210. The House Sparrow, Crow, Starling and Black-capped Chickadee have the largest totals. The fifth party had the thrill of the day in adding a Hudsonian Chickadee to the Bird Census list for the first time. A good feature of the census this year was that all parties went on the same day. This, and fairly close adherence to established routes, should be postulated in future years.—R.E.DeL.

PAKENHAM, December 23.—8.30 a.m. to 4.30 p.m. Very cold, fresh north wind, dull sky with intermittent sunshine, 8 in. of snow. Temp. 16° at start, 8° at return. All observers separate in morning, two together in the afternoon. Travelled by skis and snowshoes a total of 25 miles. Owing to the cold winds, most of the birds were quiet and confined to sheltered areas. All Grouse were hidden in the snow.

Ruffed Grouse, 5; Hairy Woodpecker, 1; Pileated Woodpecker, 1; Blue Jay, 5; Starling, 1; Evening Grosbeak, 4 (singing from sumac at 4 p.m.); Pine Grosbeak, 4 (1 rosy male); Redpoll, 32; Snow Bunting, 168; English Sparrow, 24; Brown Creeper, 1; White-breasted Nuthatch, 3; Black-capped Chickadee, 27; Golden-crowned Kinglet, 2. Total: 14 species; 278 individuals.

Starlings, which are wintering here, appear in small flocks. A single bird fed daily in a farmyard during early December. On December 20th a Starling flew into our woodshed and killed itself in an attempt to fly out through the window. Snow Buntings are very plentiful.—EDNA G. ROSS, VERA M. ROSS, ALLAN F. ROSS.

TORONTO, December 25.—Bright sun; no wind; temperature 22° at 7.30 a.m.; 2 inches of dry snow, river and ponds frozen solidly for some days. Three parties. One up the Don Valley working north from Leaside and the west branch of the river; another took in Cedar Vale, a wooded valley in the west edge of the city, then traversed High Park and Sunnyside lake front. The third party devoted its time to the Humber valley entirely. This covered varied types of country and yielded some surprises both in birds seen and birds absent. American Merganser, 1; American Golden-eye, 4; Long-tailed Duck, 65 (2 flocks); Long-eared Owl, 3; Saw-whet Owl, 1; Great Horned Owl, 3 (these Owls have been often seen lately, 2 being seen in the same ravine previously

the same day); Hairy Woodpecker, 3; Downy Woodpecker, 11; Starling, 4; Blue Jay, 3; American Goldfinch, 3; Snow Bunting, 1; White-throated Sparrow, 1 (This was one of the surprises and believed to be the first real winter record for Toronto. The bird was seen closely by four observers in a bush-covered hillside, where it found abundance of shelter. The bird seemed in good condition and occasionally uttered its tiny wiry call note. The observer, who knew of its presence, reported it as being seen here all fall); Tree Sparrow, small flocks; Slate-coloured Junco, 10; Song Sparrow, 2 (this species is seen sparingly almost every winter in the right habitat); Swamp Sparrow, 1 (in company or at least at same spot as White-throated Sparrow, identified beyond doubt and collected following day, December 26th, specimen now in Royal Ontario Museum, proved to be a male in good condition with full stomach) Maryland Yellow-throat, 1 (This was one of the rarities of the day and quite a surprise. A fine male was found in a sheltered ravine in High Park. Four observers kept this bird under observation for some 30 minutes at close range, during all its manoeuvres, and reported it very lively, in good plumage, and uttering its characteristic note. In Toronto this species leaves for the south in October, so to see one lively and noisy on Christmas day was a real treat. This is believed to be the first Toronto winter record. A trip was made the next day for further observation, but the Yellow-throat was nowhere to be seen, nor were the Tree Sparrows or Song Sparrow which were with it the day before); Winter Wren, 1 (another rarity, although hardly unexpected. One seen in same ravine as White-throated Sparrow and Swamp Sparrow); White-breasted Nuthatch, 5; Chickadee, abundant; Brown Creeper, 1; Golden-crowned Kinglet, 2 (both females and alone). Total, 23 species; 125+ individuals. Screech Owl (though not strictly seen as an observation by parties out, but inasmuch as a grey sample of this bird was found in a friend's garage on Christmas morning, it can hardly be denied a place on the list of birds extant on the day). Strange to say, although much observing was done on the waterfront, not a single Gull of any kind was seen by any one at any time.—JAS. L. BAILLIE, JR., and STUART L. THOMPSON.

December 26th.—I visited High Park in hopes of seeing the Maryland Yellow-throat, but failed to do so. The bird had presumably moved on in its wanderings, as it was very active. However, in my search I came upon a flock of Tree Sparrows, among which was a White-throated Sparrow. This spot is miles away from the

ravine in which the White-throated Sparrow was seen yesterday, and with a built-up city area between, so that it seems quite probable that these were two different individuals. This one of to-day was quite at ease among the Tree Sparrows, and was watched closely for some time. It was a rather soiled male. His only note was the feeble call readily distinguishable from that of the Tree Sparrows. He paid no attention to my imitation of his song.—STUART L. THOMPSON.

TRENT RIVER AREA, Glenross, Wellman's and Hoard's Stations, December 25th.—7 a.m. to 5 p.m. Clear; 4 in. of snow; wind southwest, very light; temperature about 5° to 10°. About 20 miles on foot. American Golden-eye, 3; Ruffed Grouse, 6; Great Horned Owl, 4-5; Hawk (sp. ?), 1; Hairy Woodpecker, 1; Downy Woodpecker, 3; Starling, 10; Pine Grosbeak, 10; House Sparrow, no estimate made; Redpoll, 3+; Tree Sparrow, 1; Song Sparrow, 2; Brown Creeper, 2; White-breasted Nuthatch, 13; Chickadee, 45; Golden-crowned Kinglet, 3. Total: 16 species; 107 individuals. On December 22 on a census taken from Glenross to Trenton Junction the following were also observed: Hooded Merganser, 1; American Merganser, 8; Snow Bunting, (heard); Junco, 11; Blue Jay, 7. A total of 15 was obtained. The weather was dull and warm. Strange to say, not a single Nuthatch was noted on the 22nd and no Blue Jays on the 25th, although common in the locality. Other species noted during December are: Goshawk, 2nd; Screech Owl, 6th; Barred Owl (one dead) on the 18th; Goldfinch, 23rd. No Northern Shrikes, Crossbills or Siskins have been noted to date.—E. W. CALVERT.

VINELAND, December 23rd.—Dull and about freezing; a few flakes of snow; most of the ground bare. The ground covered was less than last year and the time for observation was only from 11 a.m. till 1.30 p.m. A feature of the census was the abundance of certain introduced species. Pheasant, 6 (1 male, 5 females); Downy Woodpecker, 1; Crow, 5; Blue Jay, 2; Starling, 100 (approximately); House Sparrow, 25 (approximately); Junco, 6; Tree Sparrow, 70 (approximately); Golden-crowned Kinglet, 2; Black-capped Chickadee, 2. Total: 10 species; 219 individuals. Additional: (observed a few days before census): Flicker, 2; Screech Owl, 1 (December 22 at Experimental Farm, Vineland); Robin (December 18 at Experimental Farm); Cardinal, female; January 2, 1928, Sparrow

Hawk.—G. H. DICKSON, JOSEPH FRETZ and W. E. HURLBURT.

SASKATCHEWAN

WHITEWOOD, December 28.—22 degrees below

zero, strong west wind, much snow. Five-hour tramp through a small marsh and across a heavily wooded vacant section. Goshawk, 1; Blue Jay, 1; Redpoll, about 100; Snowflake, 1 heard; Black-capped Chickadee, 5; Totals: 5 species; 108 birds.—E. M. and J. E. CALLIN.

NOTES AND OBSERVATIONS

MAKING TWO WORMS GROW WHERE ONLY ONE GREW BEFORE.—It would be considered remarkable, if an experimentalist could clip off a tiny fragment of a dog's ear and by supplying suitable environment make the fragment grow into a complete dog. But Professor W. Coe, the annelid specialist, is doing something as surprising. He is working on the regeneration of worms and endeavouring to determine the smallest fragment that is capable of reproducing the entire animal. He has found that tiny pieces 1/20,000 the size of the original animal are capable of reproducing a miniature of the whole. This is comparable to the size of the end joint of the little finger, as compared with the body of a human being.—E.M.K.

A GEOLOGICAL STROKE OF LIGHTNING.—A large fulgerite or lightning tube has recently been secured by the Peabody Museum at New Haven, Conn. Such a tube is formed where lightning has struck a bed of sand and fused the sand as it descended forming a hollow glassy tube. The specimen was found on the shore of Lake Congomond, which is near the edge of the northern boundary of Connecticut, and was dug up by Professor C. O. Dungan. Plans are being made to display it in the Hall of Mineralogy.—E.M.K.

WOODLICE (ONISCOIDEA) FROM BRITISH COLUMBIA.—As a supplement to my article about this subject (*C.F.-N.*, Vol. 40, p. 167), it is perhaps worth recording that according to the late Prof. John Macoun's manuscript notes about the Crustacea collected by himself, C. H. Young, and W. Spreadborough, in British Columbia 1908-10, sixteen specimens of *Ligia (Ligyda) pallasii* were secured on rocks at high tide, near Ucluelet, on the west coast of Vancouver island, in June-July, 1909.—FRITS JOHANSEN.

There is therefore little doubt that the fairy-shrimp figured by Wright is the male of *E. gelidus*, the only species so far recorded from Ontario (see *Canad. Field-Natural.*, Vols. 35-41, 1921-27.).

It is worth while calling attention to these figures by Wright; because they have apparently been hitherto overlooked by writers on Canadian freshwater Crustacea, including myself.—FRITS JOHANSEN.

NATURAL HISTORY NOTES FROM BAKER LAKE, N.W.T.—In the fall of 1927 bird life was very scarce, nothing being seen at Baker Lake post. There were no owls at all. Mr. Hoyes Lloyd has asked me, "Why did the Snowy Owls come south in such large numbers during the past winter?" (1926-27), and desires to know whether I can throw any light on the extraordinary migration. I have no idea of the cause for the large number of owls in 1926. The natives seem unable to offer any explanation for their abundance.

Just before Christmas one of the post natives killed an otter, the first ever reported in the vicinity. The otter was in good condition, and was evidently making a good living. The otter put up a great fight with a dog which the native released, fastened on to the top lip of the dog and was shot there.—W. O. DOUGLAS.

MARINE EXPEDITION TO WEST INDIES.—During the Christmas vacation, Professor Richard M. Field of Princeton University conducted a marine expedition to the Bahama Banks in the West Indies. The party chartered a sixty-foot gasoline yacht at Miami, Florida, and made a seven days' cruise along the cays (or keys) on the east side of the Gulf Stream from Bimini to Andros and return. In spite of heavy northeast and northwest gales, diving operations and submarine photography were accomplished, and numerous bottom samples were taken. Some of the results of the expedition will be described in an early number of this magazine.—E.M.K.

RUSSIAN GEOLOGICAL SURVEY.—It is an interesting fact that while the Soviet government of Russia has eliminated many things of the old

order, it has made the Russian Geological Survey the largest organization of its kind in the world, having an appropriation of \$3,200,000 in 1926 and 96 permanent employees. A special branch is engaged in prospecting in the West Ural. On an area of four square miles, a supply of 68,000,000 metric tons of K_2O has been found. Geophysical methods particularly are being studied and applied under Professor Mushketov's direction.—E.M.K.

QUATERNARY GLACIATION IN BANKS ISLAND.—An inquiry addressed to V. Steansson concerning his knowledge of evidences of general glaciation in the western part of the Arctic archipelago elicited the following information: "I saw a great many obvious moraines in northwestern Banks island. I do not recall seeing such moraines in any of the other islands although I hunted over them extensively."—E.M.K.

"WHAT ARE FOSSILS GOOD FOR?"—The question "What are fossils good for?" with which curious wayfarers so often interrupt the palæontologist's search for trilobites or ammonites, has been very effectively answered by Prof. E. W. Berry, who writes:

"Geologic correlation may seem remote from the affairs of the workaday world and yet upon its successful consummation rests not only the understanding of the local and general relations underground that are the basis of all exploitation of artesian waters, oil, and other mineral resources of the earth, but it is of prime im-

portance in determining the places of origin and the paths of migration of the life of by-gone days."—E.M.K.

Eubranchipus Vernalis NOT RECORDED FROM ONTARIO.—In his admirable report on the fish and fisheries of Ontario (Ontario Game and Fish Comm. Report, Toronto, 1892, p. 419-276), Prof. R. Wright, gives, on p. 437, fig. 9, six illustrations as examples of *Eutomostraca* serving as food for Whitefishes (*Coregonidæ*), viz.:

Asellus communis

Gammarus sp.

Branchipus vernalis

Daphnia pulex

Cypris candida

Cyclops sp.

The *Gammarus* sp. is undoubtedly either *G. fasciatus* or *G. limnæus*, both of which species have been recorded from Ontario (see *Canad. Field-Natural.*, Vol. 34, 1920, pp. 129-30); but the fairy-shrimp figured is certainly *not* the male of (*Eu*)*branchipus vernalis*, which in Canada so far has only been recorded from Southern British Columbia (see *Canada. Field-Natural.*, Vol. 35 1921, p. 132), and looks quite different. A comparison of Wright's figure with that of *E. vernalis* given by A. S. Packard (Monograph Phyllopod Crust. North Ameri., Wash., 1883, Plate XI, fig. 2), shows the differences at a glance; the male of *E. vernalis* having *short*, broad and flat, frontal organs; while in *E. gelidus* they are *long* and slender. The claspers (second pair of antennæ) are also quite different in the males of the two species.

OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

Published by Authority of the National Parks of Canada Branch, Department of the Interior, Canada

In the following returns upon banded birds it will be noted that some returns may be thought to indicate, from the date of capture, violations of the Migratory Birds Act of Canada and the United States. The great majority of returns, which seem to indicate violations, are from birds accidentally caught in traps set for fur-bearing mammals, from birds caught in fish nets, killed by oil, or from birds found dead from unknown causes. Appropriate action has been taken in connection with the few returns which indicate illegal shooting.

RETURNS UPON BIRDS BANDED IN 1921

BLACK DUCK, No. 5,177, banded by H. S. Osler, at Lake Scugog, Ontario, on September 15, 1921, was shot in a marsh about two miles southeast of Birds Nest, Virginia, on December 18, 1926.

BLACK DUCK, No. 4,823, banded by H. S.

Osler, at Lake Scugog, Ontario, on September 26, 1921, was shot at the Canadian Club, St. Clair Flats, Ontario, on November 19, 1926,

BLACK DUCK, No. 37,356, A.B.B.A., banded by H. S. Osler, at Lake Scugog, Ontario, on October 2, 1921, was shot at Peconic Bay, Long Island, New York, on January 7, 1927.

BLACK DUCK, No. 37,365, A.B.B.A., banded by H. S. Osler, at Lake Scugog, Ontario, on October 2, 1921, was shot at Port Perry, Lake Scugog, Ontario—reported November 2, 1927.

RETURNS UPON BIRDS BANDED IN 1922

HERRING GULL, No. 201,527, yg., banded by D. A. Déry, at Upper Razade, Quebec, on

June 24, 1922, was killed at Isle-Verte, Témiscouata County, Quebec, on August 10, 1927.

MALLARD, No. 102,677, banded by Frederick C. Lincoln, at the Sanganois Club, Browning, Illinois, on March 11, 1922, was shot by a resident of Stratchclair, Manitoba, on October 8, 1927.

MALLARD, No. 230,477, banded by F. C. Lincoln, at the Sanganois Club, Browning, Illinois, on November 22, 1922, was shot—reported by a resident of Plunket, Saskatchewan, on December 7, 1927.

MALLARD, No. 230,840, banded by F. C. Lincoln, at Browning, Illinois, on November 26, 1922, was caught in a rat trap and found dead at Little Trout Lake, about ninety miles northwest of Prince Albert, Saskatchewan, on May 7, 1927, and reported as a male.

BLACK DUCK, No. 101,219, banded by H. S. Osler, at Lake Scugog, Ontario, on August 25, 1922, was killed at Fort Churchill, Hudson Bay, Manitoba, on October 1, 1926.

BLACK DUCK, No. 207,621, banded by H. S. Osler, at Lake Scugog, Ontario, on September 16, 1922, was shot on the shore of Lake Erie, a short distance from Erie, Pennsylvania, on November 12, 1926.

RETURNS UPON BIRDS BANDED IN 1923

MALLARD, No. 232,087, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 12, 1923, was recaptured at the same station on June 10, 1924, and was killed at a place one mile south of Bosca, Louisiana, on November 9, 1926.*

BLACK DUCK, No. 202,574, banded by H. S. Osler, at Lake Scugog, Ontario, on August 24, 1923, was shot on Evans Marsh, six miles south of Guelph, Ontario, on October 24, 1923.

BLACK DUCK, No. 296,195, banded by H. S. Osler, at Lake Scugog, Ontario, on September 18, 1923, was shot at the Big Pond, about fourteen miles inland from Lomond, which is situated on Bonne Bay, on the northwest coast of Newfoundland—reported on November 21, 1927.

BLACK DUCK, No. 296,416, banded by H. S. Osler, at Lake Scugog, Ontario, on September 29, 1923, was killed on the Catawba River, east of Winnsboro, South Carolina—reported on December 17, 1926.

BLACK DUCK, No. 297,248, banded by H. S. Osler, at Lake Scugog, Ontario, on October 2, 1923, was shot in Big Creek Marsh, Ontario, in the fall of 1926 before December 4th.

PINTAIL, "No. 2, D.W.G.Van.B.C.", banded by Donald W. Gillingham, on Zone Island, Fraser River Delta, British Columbia, on September 30, 1923, was shot at Sea Island, British Columbia, on October 1, 1923.

CANVAS-BACK, No. 204,261, banded by A. A. Allen, at Cayuga Lake, New York, on February '26, 1923, was shot at Seward Lake, fifteen miles west of Swift Current, Saskatchewan, on October 1, 1927.

CANADA GOOSE, No. 202,127, first banded by Jack Miner, at Kingsville, Ontario, in the

first week of May, 1923, with one of Mr. Miner's bands, was wing-clipped and shipped to the Poultry Division, Experimental Farm, Ottawa, Ontario, on May 8, 1923, banded on its other leg with band No. 202,127, by Hoyes Lloyd, on June 7, 1923, and was shot on Currituck Sound, near Currituck Courthouse, North Carolina, on November 12, 1926.*

SWAINSON'S HAWK, No. 233,104, juv., banded by Herman W. Battersby, at Oak Lake, Manitoba, on July 29, 1923, was shot on a farm at Terence, Manitoba, on June 22, 1927.

SLATE-COLOURED JUNCO, No. 74,994, ad., banded by R. W. Tufts, at Wolfville, Nova Scotia, on February 19, 1923, repeated at the same station until February 21, 1923, and was recaptured at the same station on May 8, 1926. This bird had a scar on one side, and was noted about the feeding station for a number of weeks before its capture on May 8, 1926; after its recapture it was noted nesting in the vicinity and was seen in the same locality all the next winter. It was found dead in a nearby garage, on April 16, 1927.†

RETURNS UPON BIRDS BANDED IN 1924

GREAT BLACK-BACKED GULL, No. 309-, 412, juv., banded by Harrison F. Lewis, on an island about three miles east of The Bluff Harbor, Saguenay County, Quebec, on July 21, 1924, was shot—reported by a resident of Daniel's Harbor, District of St. Barbe, Newfoundland, on September 26, 1927. The report stated that the bird had been shot "this season".

RING-BILLED GULL, No. 226,584, juv., banded by Harrison F. Lewis, on Fog Island, Saguenay County, Quebec, on August 10, 1924, was picked up dead on Treland's Flats, Bellport Bay, eastern end of the Great South Bay, Long Island, New York, on September 13, 1927. The bird had been shot, evidently shortly before it was picked up.

KITTIWAKE, "No. 70,450, Inform Witherby High Holborn London", nestling, banded by Mrs. T. E. Hodgkin, on the Farne Islands, Northumberland County, England, on June 30, 1924, was shot at Tikkoraluk, Grosswater Bay, Hamilton Inlet, Labrador, about fifteen miles from the Hudson's Bay Company's post at Rigolet, Newfoundland Labrador, on October 28, 1925.‡

MALLARD, No. 231,901, banded by Clarence E. Chapman, at Oakley, Berkeley County, South Carolina, on February 10, 1924, was killed at Setting Lake, Mile 137 of Hudson Bay Railway, Manitoba, about May 10, 1927.

MALLARD, No. 232,676, ♀, banded by John Broeker, at Portage des Sioux, Missouri, on February 25, 1924, had its band removed by a muskrat trapper, at Silver Bay, Manitoba, about one hundred and twenty-five miles northwest of Winnipeg, about the last week of April, 1924.

MALLARD, No. 305,054, banded by John Broeker, at Portage des Sioux, Missouri, on March 22, 1924, was shot at or near Kelvington, in Town-

*C.F.N., XLII, 1928, p. 19.

†C.F.N., XL, 1926, p. 159.

‡British Birds, XX, No. 8, Jan. 1, 1927, p. 203.

*C.F.N., XL, 1926, p. 159.

ship 37, Range 11, West of the 2nd Meridian Saskatchewan, on or about November 1, 1925.

MALLARD, No. 305,418, ♂, banded by F. R. Butler and D. C. Campbell, at Deer Lake, British Columbia, on April 25, 1924, was killed on Chatcolet Lake, Benewak County, Idaho, on October 26, 1927.

MALLARD, No. 305,421, banded by F. R. Butler and D. C. Campbell, at Deer Lake, British Columbia, on April 25, 1924, was shot at East Delta, British Columbia, on December 19, 1926, and reported as a male.

MALLARD, No. 297,938, banded by H. S. Osler, at Lake Scugog, Ontario, on October 27, 1924, was killed at a place ten miles north of St. Augustine, Florida, about December 27, 1926.

MALLARD X ENGLISH CALL DUCK, No. 309,722, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 1, 1924, was killed at Daley Ranch Bar XL, about twenty miles northwest of Tryon, McPherson County, Nebraska—reported on October 10, 1927.

BLACK DUCK, No. 297,816, banded by H. S. Osler, at Lake Scugog, Ontario, on September 8, 1924, was killed at a place between Marshall Hall and Indian Head, Charles County, Maryland, on December 11, 1926.

BLACK DUCK, No. 297,823, banded by H. S. Osler, at Lake Scugog, Ontario, on September 12, 1924, was recovered on the Potomac River, near Marshall Hall, Maryland, a few miles from Washington, D.C.—reported on December 13, 1927.

BLACK DUCK, No. 297,853, banded by H. S. Osler, at Lake Scugog, Ontario, on September 15, 1924, was shot at a place near Bayshore, Long Island, New York, during the fall of 1926.

BLACK DUCK, No. 297,873, banded by H. S. Osler, at Lake Scugog, Ontario, on September 16, 1924, was shot in Tonawanda Creek, within the confines of the Tonawanda Indian Reservation, Genesee County, New York, about four miles east of Akron, on March 22, 1927.

BLACK DUCK, No. 323,162, banded by H. S. Osler, at Lake Scugog, Ontario, on September 29, 1924, was shot in Hay Bay, Lennox County, Ontario, one and one-half miles from Lake Ontario, on November 12, 1927.

BLACK DUCK, No. 323,226, banded by H. S. Osler, at Lake Scugog, Ontario, on October 1, 1924, was killed at a place about two miles north-east of the village of Reaboro, Victoria County Ontario, on September 14, 1927.

BLACK DUCK, No. 323,308, banded by H. S. Osler, at Lake Scugog, Ontario, on October 3, 1924, was shot at the Lakewood County Club, on the south side of Lake Manitoba, Township 14, Range 8, West of the 1st Meridian, Manitoba, on October 25, 1927.

BLACK DUCK, No. 323,386, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1924, was trapped and had its band removed in Rama Township, Ontario County, Ontario, on April 9, 1927.

BLACK DUCK, No. 323,391, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1924, was killed at Raccoon Creek Pond, on Murphy Island, South Carolina, on November 29, 1926.

BLACK DUCK, No. 323,474, banded by H. S. Osler, at Lake Scugog, Ontario, on October 16, 1924, was shot by a resident of Ridgetown, Ontario, on September 30, 1927.

BLACK DUCK, No. 323,490, banded by H. S. Osler, at Lake Scugog, Ontario, on October 16, 1924, was shot at Port Perry, Lake Scugog, Ontario—reported November 2, 1927.

BLACK DUCK, No. 323,558, banded by H. S. Osler, at Lake Scugog, Ontario, on October 22, 1924, was shot at La Salle, New York, on the Niagara River, five miles above Niagara Falls, on November 21, 1926, and reported as a Mallard.

BLACK DUCK, No. 323,578, banded by H. S. Osler, at Lake Scugog, Ontario, on October 23, 1924, was killed on the grounds of the Ottawa Game and Fur Farm, Catawba Township, Ottawa County, Ohio, during the month of October, 1926.

BLACK DUCK, No. 323,597, banded by H. S. Osler, at Lake Scugog, Ontario, on October 25, 1924, was shot at a place six miles below Thurso, Quebec, on or about September 29, 1926.

BLACK DUCK, No. 297,947, banded by H. S. Osler, at Lake Scugog, Ontario, on October 29, 1924, was shot at a place about sixty miles from the mouth of the Kapisko River, which flows into James Bay, Ontario, during the third week of May, 1927.

BLACK DUCK, No. 321,770, banded by H. S. Osler, at Lake Scugog, Ontario, on October 31, 1924, was killed on the marshes of the Daw Hoo River, in Charleston County, South Carolina, on January 1, 1927, and reported as a female.

BLACK DUCK, No. 321,842, banded by H. S. Osler, at Lake Scugog, Ontario, on November 4, 1924, was caught in a muskrat trap at Hancocks Bridge, New Jersey, on February 15, 1927.

PINTAIL, No. 305,431, ♂, banded by J. G. Cunningham, on Lulu Island, British Columbia, on April 7, 1924, was "taken" and had its band removed at Tule Lake, Modoc County, California, on October 16, 1926.

RING-NECKED DUCK, No. 321,787, banded by H. S. Osler, at Lake Scugog, Ontario, on November 2, 1924, was killed off Stump Neck, the Government Reservation, near Indian Head, Maryland, on December 18, 1927.

GREATER SNOW GOOSE, No. 237,502, banded by Edouard Duval, at Cap Tourmente, Montmorency County, Quebec, on April 25, 1924, was killed off Egg Island Point, Cumberland County, New Jersey, during the latter part of January, 1927.

BLACK-CROWNED NIGHT HERON, No. 301,304, flg., banded by George Lang, at Indian Head, Saskatchewan, on July 4, 1924, was found dead on the road-side by James River, near Oakes, North Dakota, shortly before May 18, 1927. It is thought that the bird probably died from starvation.

WILSON'S SNIPES, No. 241,721, banded by J. A. Munro, at Colquitz, Vancouver Island, British Columbia, on December 23, 1924, was killed at a place near Sumas Lake, British Columbia, on or about October 20, 1927.

SWAINSON'S HAWK, No. 309,007, nestling, banded by R. H. Carter, Jr., at Muscow, Sas-

katchewan, on August 10, 1924, was shot at Ellendale, North Dakota, on September 18, 1926.

DUCK HAWK, No. 310,753, yg., banded by W. H. B. Hoare, at a place five miles west of King Point, Yukon Territory, on July 30, 1924, was killed at a place five miles below Duchesne, on the Duchesne River, Duchesne County, Utah, on February 20, 1925.

BRONZED GRACKLE, No. 274,145, flg., banded by George Lang, at Indian Head, Saskatchewan, on June 7, 1924, was recovered by a resident of the same locality, on October 1, 1927.

BRONZED GRACKLE, No. 316,447, nestling, banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on July 12, 1924, was captured at a place about twelve miles from Lemberg, Saskatchewan, some time before June 22, 1927.

ROBIN, No. 264,300, ad. ♀, banded by Ralph E. DeLury, at Ottawa, Ontario, on July 12, 1924, was re-captured at the same station on May 23, 1926, and was found dead at Barnesville, North Carolina, on February 1, 1927.

RETURNS UPON BIRDS BANDED IN 1925

PUFFIN, No. 368,667, ad., banded by Harrison F. Lewis, on Cliff Island, St. Mary Islands, Saguenay County, Quebec, on July 19, 1925, was captured and accidentally killed on the same island, on July 27, 1927.

COMMON MURRE, No. 334,184, ad., banded by Harrison F. Lewis, on Flat Gull Island, Wolf Bay, Saguenay County, Quebec, on July 27, 1925, was found dead floating on the water by the shore at Comeau's Hill, Yarmouth County, Nova Scotia, about the middle of April, 1927.

RAZOR-BILLED AUK, No. 368,629, ad., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on July 16, 1925, was picked up dead in the water near Cape Sable, Nova Scotia, about December 2, 1926, and reported as a Murre.

CASPIAN TERN, No. 325,292, ♀, banded by William I. Lyon, at Gravelly Island, Michigan, on July 21, 1925, was collected for scientific purposes at Long Point, Norfolk County, Ontario, on June 23, 1927.

MALLARD, No. 322,320, banded by Clarence E. Chapman, at Oakley, Berkeley County, South Carolina, on March 3, 1925, was shot at "Lynch's Point", at the junction of the White Mud River with Lake Manitoba, Manitoba—reported September 27, 1927.

MALLARD, No. 300,558, banded by T. E. Musselman, at Scobey Lake, Missouri, on March 25, 1925, was shot at a place forty miles north-east of North Battleford, and twenty miles north of Richard, Saskatchewan, during the hunting season of 1926.

MALLARD, No. 324,910, banded by Gussie Innes, at Kinalmeaky Farm, Headingly, Manitoba, on April 15, 1925, was shot at Cycle Lake, Ashland County, Wisconsin, on November 1, 1926.

MALLARD, No. 313,165, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 8, 1925, was shot at the mouth of the Sturgeon River, which flows out of the east end of Lac Ste. Anne, Alberta, on September 16, 1926.

MALLARD, No. 309,775, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 9, 1925, was killed by a resident of Memphis, Tennessee, at the Wapanoco Club, on December 3, 1926. This bird had a white ring around its neck.

MALLARD, No. 313,182, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 10, 1925, was killed by a resident of Lonoke, Arkansas, on January 10, 1927, and reported as a female.

MALLARD, No. 313,185, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 11, 1925, was killed at Egan, Louisiana, on December 17, 1926, and reported as a female.

MALLARD, No. 232,351, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 28, 1925, was killed at Thousand Springs Creek, at an elevation of about four thousand and nine hundred feet, about twenty miles north of Montello, Nevada, on December 19, 1926, and reported as a male.

MALLARD, No. 232,391, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 5, 1925, was killed on November 18, 1927, and reported by a resident of Dallas, Texas.

MALLARD, No. 388,507, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 21, 1925, was shot at Highvale, Alberta, fifty miles west of Edmonton, on October 1, 1927.

MALLARD, No. 388,514, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 24, 1925, was killed in Jeff Davis Parish, Louisiana, six miles northwest of Jennings, on December 28, 1926, and reported as a female.

MALLARD X WHITE ENGLISH CALL DUCK, No. 309,761, dark, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 9, 1925, did not migrate in the fall on account of mild weather, was wintered and turned loose in the spring of 1926 as a one-year-old male, and was found in a barn at Govan, Saskatchewan, on November 14, 1927. The bird was not wounded and was very tame. It is being kept in captivity until the spring of 1928.

MALLARD X WHITE ENGLISH CALL DUCK, No. 309,777, dark, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 9, 1925, was shot on August Laurance Range, Jackson County, Texas, on January 31, 1927.

MALLARD X WHITE ENGLISH CALL DUCK, No. 309,791, dark, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 9, 1925, did not migrate in the fall on account of mild weather, was wintered and turned loose in the spring of 1926 as a one-year-old male, and was shot on Section 25, Township 27, Range 29, West of the 2nd Meridian, near Davidson, Saskatchewan, on September 18, 1926.

BLACK DUCK, No. 323,817, banded by H. S. Osler, at Lake Scugog, Ontario, on September 24, 1925, was shot at a place one mile south of Peru, Illinois, on November 27, 1926, and reported as a male.

BLACK DUCK, No. 323,827, banded by H. S. Osler, at Lake Scugog, Ontario, on September 24, 1925, was shot at the Mallard Gun Club, Ottawa County, Ohio, adjacent to Sandusky Bay, on November 20, 1926.



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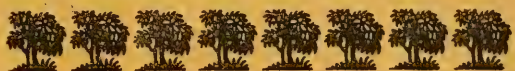
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The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first were *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July, and August. Its scope is the publication of the results of original research in all departments of Natural History.

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Hawk Owl; scale, $\frac{1}{6}$



Osprey; scale, $\frac{1}{10}$

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No. 5

WILD LIFE OF JASPER PARK

By E. M. KINDLE



IN THE DEVELOPMENT of our modern civilization man has lost much of the kindly, brotherly feeling which characterized his attitude towards animal life of all kinds during the Middle Ages and earlier. Animals had for a long time much the same rights under the law as man, and were subject to similar penalties, even to the extent of excommunication for bad behaviour*. The Greeks, who were aware of the affectionate care bestowed by young storks on their aged parents in such acts as stripping themselves of their down for the parental comfort, framed the old Greek law called "The Law of the Stork", which obliged children to care for their parents in old age. Primitive peoples instinctively placed men and animals on a footing of equality.

In the National Parks of Canada this wise and kindly attitude of the ancients towards wild life has been revived and put into operation. In these extensive mountain areas the present and future generations will be able to enjoy the wild animal life which is elsewhere rapidly becoming extinct.

In the plant and animal life of the Park we have an assemblage which has survived all the vicissitudes of the Glacial epoch. When the continental ice sheet was at its maximum development practically all the life of the mountains was exiled from the mountain realm of Canada. The lichens and a few Alpine plants, probably, clung to the tops of the highest mountain ridges. All the plants characteristic of zones below the Arctic-Alpine zone, together with the animals which comprised the Rocky Mountains fauna in Tertiary times, were compelled to find sanctuaries far to the south during the Great Ice Age. Much of the Canadian Tertiary fauna and flora probably took refuge for a few hundred thousand years in the mountains of the south western United States,

where it no doubt came into contact and competition with a southern assemblage materially different from itself. When a temperate climate finally replaced the arctic conditions of the Glacial epoch in southern Canada, the mountain valleys again welcomed back the forests and the animals which had lived in them. But it was not the old Tertiary life which the ice had driven out; it was a flora and fauna altered by a sojourn of perhaps a million or more years in a southern environment, by adjustment to many and varied changes of climate, and by a long struggle for existence with forms of life unknown in the pre-glacial period in the northern Rockies. It was, in other words, the recent, or present, plant and animal life which slowly returned to the mountains as the ice withdrew. The process of re-establishment of the forest is still in progress around the frontal moraines of the small glaciers which are mere remnants of the great ice sheets that once filled all the mountain valleys. At Mount Edith Cavell glacier the spruce forest has taken full possession of and covered the outermost moraine, but its extension over the inner moraine must await the development of a suitable soil. This will require a considerable period of time.

Jasper Park lies within what naturalists call the Boreal region of North America. Three life zones are represented in the Park area: the Canadian, Hudsonian and Arctic. The valleys of the Athabaska, Miette and Rocky rivers and the lower part of their tributary streams, lie in the Canadian zone, which is characterized by such trees as the Douglas fir, black spruce, jack-pine, aspen and balsam poplar. Among the mammals limited to this zone are mule deer, red squirrels, chipmunks and deer mice. Above the Canadian zone is the Hudsonian, characterized by the sub-Alpine fir (*Abies lasiocarpa*), the caribou, Richardson's vole, and the marten. The Arctic-Alpine zone includes the region above timber line. Here we find the mountain goat, marmot, rosy finch and the white-tailed ptarmigan. The grizzly bear and the caribou are equally at home in the Arctic-Alpine and the Hudsonian

*"M. Benoist Saint-Prix has collected eighty sentences of death and excommunications that were pronounced between 1120 and 1741 against every species of animals, from the ass to the grasshopper.

Jean Milon, an officer of Troyes, pronounced the following sentence on the 9th of July, 1516: "Having heard the parties, and granting the request of the inhabitants of Villeneuve, we admonish the caterpillars to retire within six days; and, in case they do not comply, we pronounce them accursed and excommunicated."—*Popular Science Monthly*, Vol. XXII, p. 248, 1882-3.

zones according to Hollister (Mammals of the Alpine Club Expedition to the Mount Robson Region; *Canadian Alpine Journal*, Special number 1912, p. 4).

The written or human history of the Park begins with the fur traders who first unfolded their blankets in the valley of the upper Athabaska. The discovery of the Athabaska pass by David Thompson in 1811 made the Athabaska river an important highway for the fur trade between the British Columbia and interior posts. This way went the gold seekers in the late fifties when the discovery of gold in the Cariboo started the first Canadian gold rush. Many interesting and picturesque travellers passed over this route across the mountains during the century which intervened between Thompson's pioneer journeys and the setting aside by the Government in 1907 of the upper Athabaska basin as a national park. One of these was the Scottish botanist David Douglas, after whom the Douglas fir of the Rocky mountains was named, who tramped through Jasper Park with 50 pounds of seed protected by an oilcloth on his back in the spring of 1827. The genial and corpulent Belgian missionary Pierre-Jean de Smet arrived in 1846 at the Athabaska pass in a cariole and undertook there a month's fast to reduce his weight sufficiently to continue on snowshoes his journey to the coast. Paul Kane, the artist who passed through the upper Athabaska valley in early winter sketching the Indians whom he met, records that the November blasts transformed his long red beard into a huge icicle. The rather startling appearance of the congealed auburn whiskers had however some compensating advantages, since Kane relates that on one occasion it deterred three hostile Indians from attacking him.

The name of Sir John Richardson, the versatile naturalist and Arctic explorer, also adds its lustre to the roster of eminent men who in the early days contributed extensively to our knowledge of the geography and natural history of the upper part of the Athabaska valley. Various animals of the Rocky Mountains fauna were first made known to science* from specimens collected for Richardson by Thos. Drummond in 1825 and 1826 between Henry house and the head of the Athabaska valley.

PLANT LIFE.—The abundance and variety of plant life in the Park is clearly indicated by the statement of the late J. M. Macoun that he found 300 species of plants within walking distance of his camp in the Athabaska valley near Jasper. Jasper Park is classic ground for the

botanist. Many Rocky Mountains species of plants were first described from collections made within the present Park limits by Drummond and Douglas in the upper Athabaska valley a century ago. Forests of conifers with a sprinkling of cottonwoods, poplars and a few other deciduous trees clothe the valleys and mountains up to timber line.

The Douglas fir is the largest and most striking forest tree in the region. It has the novel distinction of producing notable quantities of sugar during dry seasons. The sugar is exuded from the tips of the leaves and appears in masses varying from $\frac{1}{4}$ to 2 inches in diameter. (Photograph, *Canadian Field-Naturalist*, Vol. 33, p. 7, 1919). The bears are acquainted with this manna of the mountains and where it is abundant in parts of British Columbia, it is reported that many trees suffer from broken branches.

Among the many flowers which add their beauty to the roads and trails along the Athabaska river in early summer are the showy Orange lily, *Lilium philadelphicum*; the Wild rose, *Rosa acicularis* Lindl.; white Camas, *Zygadenuse legans* Pursh; and the yellow shrubby Cinquefoil, *Potentilla fruticosa* L. In late summer the long-stemmed, blue panacled Asters, *Aster MacCallæ* Rydb., together with a large variety of other plants, brighten the lower valleys.*

Most plants are adjusted to certain physical and climatic conditions. In Jasper Park the mountains give a wide range of these conditions, the elevations, within the Park, ranging between 3283 and nearly 12,000 feet. A series of plant zones results from this wide range of levels. The most conspicuous of these zones terminates at timber-line—the upper limit of the forests. Above this level, which is in the neighbourhood of 6,500 feet, Alpine meadows display a profusion of flowers with a brilliant array of colours. One of the delights of a trip over a high mountain pass or the ascent of one of the peaks near Jasper is the constantly changing composition of the flora as one ascends. The higher floral zones may be seen on Whistler's mountain, the Tonquin valley, at Mount Edith Cavell, or along the Shovel Pass trail.

On the sandy valley just below Edith Cavell glacier and the adjacent mountain slopes the Alpine flora is represented by such plants as the following:

Cotton grass, *Eriophorum Scheuchzeri*, Hoppe
Labrador tea, *Ledum grœnlandicum* Oeder

Yellow heather, *Phyllodoce glanduliflora* (Hook.) Coville

*The Fauna and Flora Boreali-Americana.

*All of the botanical names are based upon collections made by the author and identified by Dr. M. O. Malte.

White heather, *Cassiope Mertensiana* (Bong.) Don

Purple heather, *Phyllodoce empetriformis* (Smith) Don.

The contrast between the plant ensemble of the Alpine meadows above timber-line and that of the lower valleys is a very sharp one. The wild roses and large red lilies which add their charm to the trails along the Athabaska river, and a host of flowers which follow the river into the mountains from the prairies, disappear from the trail-side long before timber-line is reached. Yellow poppies, pink and white heather and many other plants which love the high cool slopes take their places. The rich flora which brightens the park-like open spaces in the Tonquin valley near the Amethyst lakes represents the plant life near the upper limit of the forest zone. Here one may see in August along forest trails an abundance of the ubiquitous Indian paint brush, *Castilleja mineata*, and small shade-loving white flowers of the Bunchberry, *Cornus canadensis*. In the open sandy spaces the creamy, white, cotton-tipped stems of Cotton grass, *Eriophorum viridicarinatum*, often entirely appropriate considerable patches of ground, as they do at Edith Cavell and other glacial lakes.*

*The plants noted here have been identified by Dr. M. O. Malte from collections made by the writer.

Among the more conspicuous flowers of the Tonquin valley are the Fireweed (*Epilobium angustifolium*) and Golden-rod (*Solidago scopulorum*). Other flowers which frequently meet the eye are *Senecio triangularis* with its arrow shaped leaves and orange coloured flowers, the long stemmed *Valeriana sitchensis* with cream coloured flowers, Fleabane (*Erigeron salsuginosus*) with its showy purple blossoms, Groundsel (*Senecio pauciflorus*) and the elegant dark blue flowered Gentian (*Gentiana propinqua*). Here one can also enjoy the dainty flowers of *Spiræa pectinata*, the tiny blossoms of Yarrow (*Achillea lanulosa*), beautiful creamy white flowers of the Grass of Parnassus (*Parnassia fimbriata*) and White and Purple heathers (*Cassiope Mertensiana* and *Phyllodoce empetriformis*) which are among the most characteristic and abundant of the Alpine plants. Other flowers which were observed in the Amethyst lakes district are Lousewort (*Pedicularis grænlantica*), Mountain sorrell (*Oxyria digyna*), Milk Vetch (*Astragalus alpinus*) a small blue flowered plant often seen growing in the midst of moss; the purple short-stemmed Arctic Fireweed (*Epilobium latifolium*), the Columbine (*Aquilegia formosa*) and the bright orange-yellow *Potentilla glaucophylla*. One of the smallest but one of the most charming of the Alpine flowers of this region is the Saxifrage (*Saxifraga austromontana*)



WHITE HEATHER.

There is perhaps no more interesting feature to be observed on the high passes than the curious transformations and adaptations assumed by the conifers to enable them to live through the low temperatures, the buffeting wintry blasts and the long period of partial or complete snow burial to which they are exposed. Spruce which have a height in the valleys of 75 feet or more become dwarfed near timber-line and often persist only by forming thick hedges three or four feet high along the border of certain terranes which through some peculiarity favour more than others the growth of trees. Individual trees at these high levels will sometimes attain the unusual height of 10 or 15 feet when surrounded by a border of low, protecting, hedge-like evergreens. All of the trees and evergreen hedgerows near the timber line indicate the direction of prevailing winds by leaning strongly towards the east and southeast. Frequently branches are altogether wanting on the west side.

After passing above the last dwarfed and struggling coniferous trees on such a route as the Shovel Pass trail, one passes into Alpine meadows with a rich profusion of flowers. These mountain meadows show a large variety of plants in which the dominant colours are yellow, blue and purple. Above timber-line along the Shovel Pass trail the flowers offer as many shades of blue as the lakes. There one sees the sky-blue Forget-me-not (*Myosotis alpestris* Schmidt), the rich dark blue Monkshood (*Aconitum delphinifolium*); the blue and purple Arctic Fireweed (*Epilobium latifolium*) and the yellow-centered, purple-flowered Fleabane (*Erigeron salsuginosus*). A large share of the golden yellow colour of the Alpine meadows is furnished by two species of Arnica (*Arnica diversifolia* Greene, and *Arnica tomentosa* J. M. Macoun). But the beautiful Cinquefoil (*Potentilla glaucophylla* Lehm.), and some other plants also contribute to the masses of gold in the high meadows. The heather-like *Dryas octopetala* L. the small-flowered Moss campion (*Silene acaulis* L.) and the masses of yellow Stone-crop (*Sedum stenopetalum* Pursh) give colour to the stony slopes where few plants thrive. Other plants noted above or near timber-line along the Shovel Pass trail are Groundsel (*Senecio pauciflorus* Pursh), Louisewort (*Pedicularis montanensis* Rydb.), *Campanula lasiocarpa* Cham., *Saussurea densa* (Hook.) Rydb., and Speedwell (*Veronica Wormskjoldii* R. & S.).

When the first September snow comes there is still a fair variety of blooming flowers in such high level valleys as Jacques Lake where Bunchberry (*Cornus canadensis*) the pretty little Twin flower (*Linnæa borealis* L. var. *americana* (Forbes)

Redher) and other plants were still common in early September.

BIRDS.—Only the most inquisitive and industrious bird lovers will discover all or most of the 101 species of birds recorded by Riley* and Taverner† from the Jasper Park regions. Some of these birds, however, do not wait to be discovered. The tourist who sits down to his first trail-side meal is likely to be joined by one or more Whiskey Jacks who are always ready to invite themselves to dinner at any camp which they may



WHISKEY-JACK.

spy. When the camp ponies are relieved of their packs and saddles for the day, it is a common event for a flock of Buffalo-birds to settle themselves on the backs of the animals where they will often stay for hours at a time. The writer has known this odd-mannered bird to follow close alongside a line of men on the trail just as they are accustomed to accompany a herd of cattle or a bunch of horses. The fondness of the Buffalo-bird for the insects which follow large animals leads to their curious association with domestic animals. Another bird which seems to seek publicity is the Osprey or Fish Hawk. Most birds make some attempt to conceal their nests and their domestic affairs but the Osprey builds its huge nest of sticks on top of an isolated tree which is frequently located near a road. One of these nests near the Maligne Canyon road is said to have been occupied for about 15 years. The Robin and slate-coloured Junco are among the birds frequently seen. The Mountain Bluebird in beauty of colour surpasses every other bird in

*Riley, J. H.: Birds Collected or Observed on the Expedition of the Alpine Club of Canada to Jasper Park, Yellowhead Pass and Mt. Robson Region; *Canadian Alpine Journal*, Special Number 1912, pp. 47-75, 2 plates.

†Taverner, P. A.: Addenda to the Birds of Jasper Park, Alta. (Published by Riley, *Can. Alpine Journal*, Special Number 1912, pp. 47-75); *Canadian Alpine Journal*, Vol. IX, pp. 62-69, 1 plate.

the region. It is even more cerulean than the blue lakes about the Lodge. Ducks, though not abundant, may be seen on most of the larger lakes. Most species of birds are more or less definitely limited to some type of habitat but the Humming-bird appears equally at home wherever flowers are to be found, from the lowest valleys to the highest Alpine meadows.

MAMMALS.—The protection extended to wild life within the Park limits has resulted in the restoration of the Rocky Mountains fauna to something like its original abundance of individuals. Here the visitor may see in a single day representatives of most of the large mammals characteristic of the Rockies. Deer, Bighorn sheep, and bear can often be inspected at close quarters from an automobile. Beavers, coyotes, moose and mountain goats still retain their shyness and are more difficult camera subjects. The black bear is the favourite kodak subject

with tourists owing to his willingness to pose at localities where he has learned by experience that he can vary his regular diet of roots, ants and berries with an occasional mess of garbage, in the vicinity of camps and hotels. The prudent man is apt to be astonished at the reckless way in which some tourists will approach a bear for a snap-shot who would probably not venture to take such liberties with a strange dog. The bears, however, seldom resent these impertinences unless the camera-man should be careless enough to place himself between a mother and her young. In such a case the kodaker may have to borrow a blanket to go home in after the mother bear has finished expressing her disapproval of such imprudent behaviour. Every camp has its stories of bears who have carried off a ham, a bag of sugar, or eaten a case of canned milk but the most unusual story reported to the writer related to a bear which carried off a suitcase. When the



BLACK BEAR.

suitcase was recovered nothing was missing except a liquor permit.

Coyotes frequently make the camper in the lower valleys aware of their presence at sunset, or even in the middle of the night, by prolonged howling concerts. E. J. Sawyer, who has felt the spell of the coyote's chorus, says:

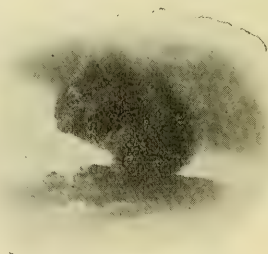
"These concerts can and do grip the man from the east in a sense that few other western things do. . . . Imagine then if you can, for it lies not in words to describe the blood-stirring effect when, out of the thick stillness, while a cold white moon shows only the jagged lines of an ancient world, a whole group of these wild dogs rend the night with their united and unearthly clamor; group after group, their elemental wildness stirred beyond further control, joining in the song, while mountains and crags resound with the tumult and buffet it about and fling it far and wide till the multifold hubbub finally dies away in the far reaches of the canyons."

The shyness of the coyotes usually keeps them out of sight. They belong with the Great Horned Owl to the night life of the forests. The staccato bark of the coyote, the laughter of the loon and the hoo-hoo of the owl are familiar sounds of the night. These and various other nocturnal sounds from unseen sources add a note of mystery to the mountain forests at night. The beaver is another of the nocturnal creatures. Its dams may be seen along the Pocahontas highway, one of the most frequented roads in the Park, but this industrious worker labours only at night and so is seldom seen. The range of the beaver is limited, owing to its use of timber for building houses and dams, to the valleys below timber line. The habitat of two others rodents, the Hoary or Whistling Marmot and the smaller Parry Marmot or "natural gopher", starts its range a little below timber-line, where the beaver stops, and continues above timber-line to the highest mountain passes. Both are burrowing animals living in large colonies. The Hoary Marmot has the curious habit of emitting a loud whistle, easily mistaken for that of a man, and simultaneously disappearing into its hole when frightened. Because of this peculiar note they are commonly called whistlers. The perplexity which the "whistler" may arouse in the mind of the visitor new to the mountains in trying to discover the source of the mysterious whistle may be increased by the disappearance of small articles which he leaves within reach of another odd little mountain creature. This is Drummonds' Wood Rat, more commonly known as the pack rat.

The habits of the beavers and the marmots have a geological aspect worthy of note. The latter number thousands of individuals and the fresh earth from their burrows on the high passes

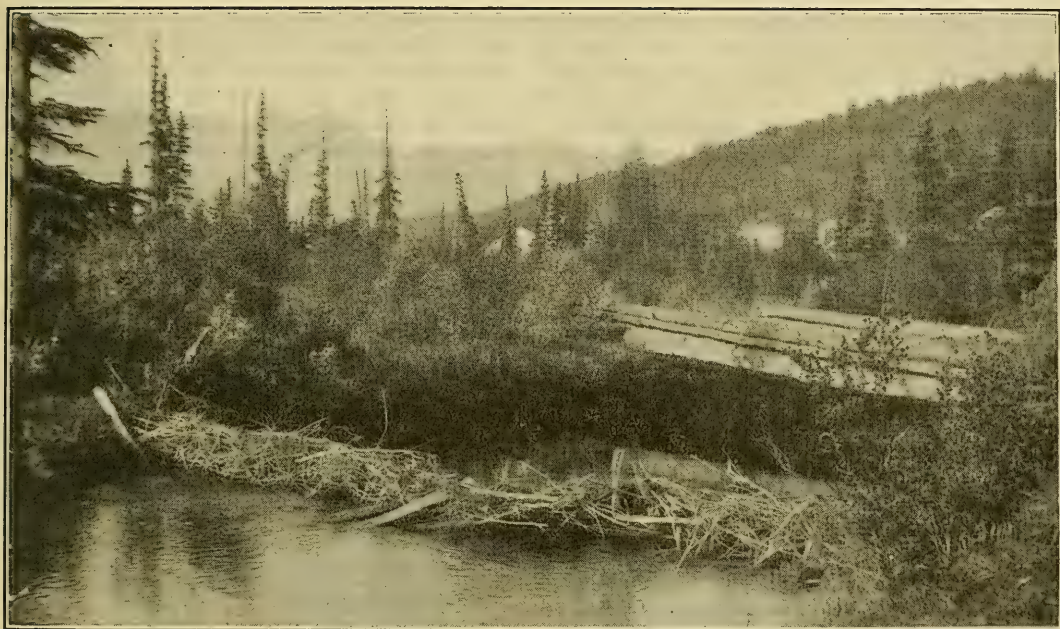
supplies an annual contribution to the sediment carried down by the brooks which is a factor in the denudation of high mountain slopes. The dam building habits of the beaver, however, turn the small streams of the lower valleys into lakes or settling basins which gather the sediments sent down by the little high level engineers who are so busily engaged in trimming down the mountain passes. It thus appears that the beavers neutralize to a considerable extent the efforts of the marmots to send the mountain summits back to the sea whence they came.

The wood rat or pack rat has a propensity for carrying into its burrow any small article which the unwary tourist may chance to leave within reach. Books are among the things which it fancies, according to one Canadian author, who reports that a novel of hers was selected by one of these discriminating rodents in preference to one of the classics which lay beside it. On the mountain crests marmots and nearly all other mammals are absent, but the lone climber may generally count on the company of a tiny chipmunk however high and barren a spot he may select for his noon lunch. This wary little creature is generally willing, if given a little encouragement, to lunch with any traveller who stops near its mountain-side home. Its larger relative, the red squirrel, is also a sociable beast and the most garrulous little creature in the forest. It is always ready to talk things over with anyone who will stop for a few moments under the



RED SQUIRREL.

tree where it is cutting its winter supply of spruce cones. It will chatter away, at the same time holding a freshly cut pine cone or a mushroom in its jaws. Sometimes the excitement of holding converse with a biped visitor at too close quarters will cause it to drop the mushroom or cone during an outburst of expletives which are doubtless highly uncomplimentary to the intruder. The pika is, like the red squirrel, a provident but rather rare little creature with the thrifty habit of laying up a large winter supply of hay, using a hole in the rocks for a barn.



BEAVER DAM, NEAR JASPER

Mountain goats are generally first seen as white specks on a background of grey limestone. If the inquisitive climber attempts to secure a closer acquaintance the specks move to precipitous slopes where it is usually impossible for the human biped to follow. The Bighorn sheep are much less shy and occupy different ranges from those frequented by the goats. They are fond of mineral water and every sulphur spring observed by the writer has sheep trails radiating from it. The deer have a similar fondness for mineral water, a fact which is well-known to the cougar, which, according to experienced hunters, makes many of its kills by lying in wait near "licks". These predatory beasts appear to be rare in the Park.

The Canadian wapiti or elk, which had become nearly extinct, has regained its place in the fauna and is said to be common in the Tonquin valley and some other parts of the Park.

The Osborn caribou is another splendid animal, almost as large as the elk, which has responded to protection with increasing numbers. Specimens taken outside the Park have been reported having antlers with a spread of 55 to 60 inches. A. B. Williams, an admirer of this animal, ascribes to it a gait which outclasses all other mountain creatures, and states that at full speed they "hardly appear to touch the ground and give the impression that they could travel over eggs without breaking them."

The mule deer is, notwithstanding its name, a beautiful creature and probably the most abundant large animal in the Park. A splendid stag demonstrated the boldness of some individuals by following the dog, which was attached to the writer's outfit, into camp one morning in a very menacing manner, stopping at intervals and stamping in a threatening manner with a fore-foot. It should be explained that this particular dog, though a large and rather formidable looking animal, had been trained by his owner neither to bark at nor to chase wild animals. Potato peels are a favourite delicacy of the deer, and a little encouragement from a cook will induce them to pay frequent visits to a camp for such delectable tit-bits.

The porcupine seems to be common at all levels below timber-line. Numerous girdled trunks of evergreens afford evidence of its presence where it is not seen.

Nearly fifty species of mammals, including both great and small creatures, are known to occur

in the Park*. Under the protection of the Park game wardens, the several species of the fauna are rapidly regaining the numerical status which they possessed before fire-arms in the hands of the great predatory biped, man, reduced many of them nearly to extinction. One of the greatest pleasures which this mountain scenery of wild life offers the visitor is the opportunity to see the Rocky Mountain fauna, one of our greatest heritages from the geologic ages, unimpaired by the ravages of man. The thoughtful visitor will rejoice that this splendid fauna is to be preserved for the benefit of the present and future generations. Here are the creatures—or their near relatives—with which his ancestors not many thousand years ago lived on something like terms of equality, before fire-arms and science made possible their rapid extinction. Back in those far-off days some individual gifted above his fellows, with the vision of a seer, may have delivered the prophecy contained in these lines:

*There was once a Neolithic man, an enterprising
wight,
Who kept his simple instruments unusually bright;
Unusually clean he was, unusually brave,
And he sketched delightful mammoths on the borders
of his cave.
To his Neolithic neighbours, who were startled and
surprised,
Said he, "My friends, in course of time we shall be
civilized.
We are going to live in cities and build churches and
make laws,
We are going to eat three times a day without the
natural cause,
We are going to turn life upside down about a thing
called gold,
We're going to want the earth and take as much as
we can hold
We're going to wear a pile of stuff outside our natural
skins
We're going to have diseases!—and accomplishments!!
—and sins!!!*

In Jasper Park one finds the opportunity to get in tune with nature and leave behind his "diseases" and "sins". No one is likely to spend a vacation on the Jasper trails without taking home with him a fair share of the robustness of spirit and physique which enabled Neolithic man to hold his own with the wild life of his time.

*Forty-seven species of mammals are recorded from the Mt. Robson and Jasper Park region by N. Hollister ("Mammals of the Alpine Club Expedition to Mt. Robson"; Canadian Alpine Journal, Special Number 1912; pp. 1-44, 13 plates) and R. M. Anderson: ("Some Notes on the Mammals of Jasper Park, Alberta", Canadian Alpine Journal, Vol. IX 1918, pp. 70-75).

SUGGESTIONS AS TO THE STUDY OF MARINE SEDIMENTS

By RICHARD M. FIELD



WE MAY STILL agree with Sir Charles Lyell that the study of present day, or active, geological processes is essential if we hope to interpret what has happened in the past—but with this proviso, unusual phenomena may require unusual *modi operandi*. We have good reason to believe that the same inorganic processes were operative in the Paleozoic as are active to-day; but we have also good reason to believe that certain processes were much more active over wider areas than they are now, and vice versa. Paleontology teaches us that the benthonic organisms were specifically less numerous and probably less varied in the lower Paleozoic seas than they are at present. We have, however, little or no knowledge of the micro-organisms which must have existed in the earlier periods of the earth's history, and which may have played a much greater rôle in the ecology and chemistry of the ancient seas than the living micro-organisms do in our modern seas. It must be admitted, however, that our present hydrosphere is extremely variable, physically, chemically, and in respect to organisms, and I believe that there are excellent opportunities for matching almost any body of marine or "fresh" water with one which we suspect may have existed in the past. In any organic reaction which has to do with chemical precipitates, it is highly improbable that the putrefaction of organisms could have played a fundamentally different rôle from what it may at the present time; but, on the other hand, we do not know the relative importance of this chemical factor now or in the past. We have also yet to learn if the by-products of the metabolism of Paleozoic micro-organisms were chemically different from the by-products of those living in our present seas. Suffice it to say that the sedimentationist knows so little about what is going on in the seas and oceans at the present time that it would be safer, as well as easier, to defer these more theoretical considerations until we have exhausted the "living" and active realms of investigation. Until we have a wider acquaintance with the conditions of sedimentation in our shallow seas, we cannot hope to accomplish much more in the study of such formations as limestones and marine black shales with their associated textures and structures. If we were to search the world for data on the processes involved in the deposition of shallow water marine deposits we should probably find certain

types of deposits being laid down under conditions which could not have been entirely foreseen or which were entirely unsuspected. Further, we might very well find that the same sort of deposit was being laid down in several places under quite different conditions. Indeed my own recent studies in Florida and the West Indies have shown similar sediments being laid down under quite dissimilar conditions; also, certain sediments (pene-contemporaneous conglomerates) being laid down under conditions which had only been suspected.

Investigations which we are carrying on in the West Indies may serve to illustrate, in part at least, the preceding remarks. The Great and Little Bahama Banks represent some 20,000 to 30,000 square miles of shallow water, marine carbonate sediments, mantling a block or horst which is bounded by deep water on all sides. The Great Bahama Bank or lagoon averages from three to five fathoms over an area of some 7,000 square miles. The islands, the largest of which is Andros, have recently been raised only a few feet above sea level. Aside from the origin of the carbonate deposits*, the physical and chemical alterations which they have undergone are particularly striking and significant because of their relation to certain important structures in the Paleozoic limestones and dolomites. I refer particularly to two different classes of conglomerates (1) Intraformational and (2) Pene-contemporaneous. In the case of the intraformational conglomerates we observed certain types being formed in the way that they had already been postulated either through world-wide studies in the Paleozoic and later limestones and dolomites, or by laboratory experiments; but we also discovered other types being formed in a quite different manner and in a way which had not been foreseen. This is particularly true of the compound intraformational conglomerate in which the phenoclasts are being derived by the wave action on little cliffs in which are bands of an older intraformational conglomerate as plastic as the clay that it was formed. While the older layer of intraformational conglomerate may have been partly the result of desiccation of the limy muds, the compound intraformational conglomerate now being formed is simply due to wave erosion. At the western margin of the Great Bahama

*Papers by Drew, Vaughan and Goldman.

horst where the waves are quarrying the oolitic rock into large boulders and depositing them on the edge of the submarine escarpment of the Santaren Channel, we were able to study the origin of pene-contemporaneous conglomerates, or those in which the phenoclasts are being derived from lithified sediments of relatively the same age as the enclosing matrix. These blocks must eventually find a resting place in from 100 to 600 fathoms, if some of them have not already done so. Perhaps at times they literally plunge into the finer grained calcareous bottom deposits which must contain organisms of relatively the same age as those included in the blocks. Were the Mississippi delta to extend further to the southeast so as to mantle the lower slopes of the Bahama submarine slope or escarpment, we should have

pene-contemporaneous conglomerate all the elements of which had been derived from the same direction. While this suggestion may appear over fanciful to some, at least it is founded upon a modicum of active phenomena and is not therefore quite so theoretical as some of our recent ideas regarding the origin of Paleozoic pene-contemporaneous conglomerates. This question immediately arises: Is our present conception regarding the origin and form of the *entire* Appalachian Geosyncline of deposition correct, or must we modify it in the light of what we see going on in the West Indies at the present time? It is quite probable that the West Indian conditions are *unusual*, but so are the Levis conglomerates.

I feel that the reason why the stratigrapher has made so little progress in the study of the sedi-



COLLECTING SAMPLES OF MARINE SEDIMENTS.

forming at the present time a pene-contemporaneous deposit very similar to that of the Levis formation at Quebec. In fact, the same type of pene-contemporaneous conglomerate could be formed without postulating the derivation of a deep water shaly facies from the east, if the Bahama horst had originally a thick cover of unfossiliferous black carbonaceous Tertiary or Cretaceous muds which were wave-cut by the sea and prograded down the steep western submarine slope. With the removal of this muddy cover and the later development of the calcareous cay rock and lagoon deposits, these materials would be added to the deep water shaly facies forming a

mentary rocks is not entirely an inherent difficulty in the subject but rather the over-emphasis of hand specimens and the lack of interest in oceanography. The present classification of the sedimentary rocks is a rather weak outgrowth of petrological methods largely derived from the students of igneous rocks and almost entirely unsuited to stratigraphical and paleo-oceanographical problems. Also, the stratigrapher is burdened with petrological terms which often confuse rather than aid him in his researches. This is largely due to the fact that many terms are ambiguous. The word pebble means little or nothing, and conglomerate is practically useless. On the other

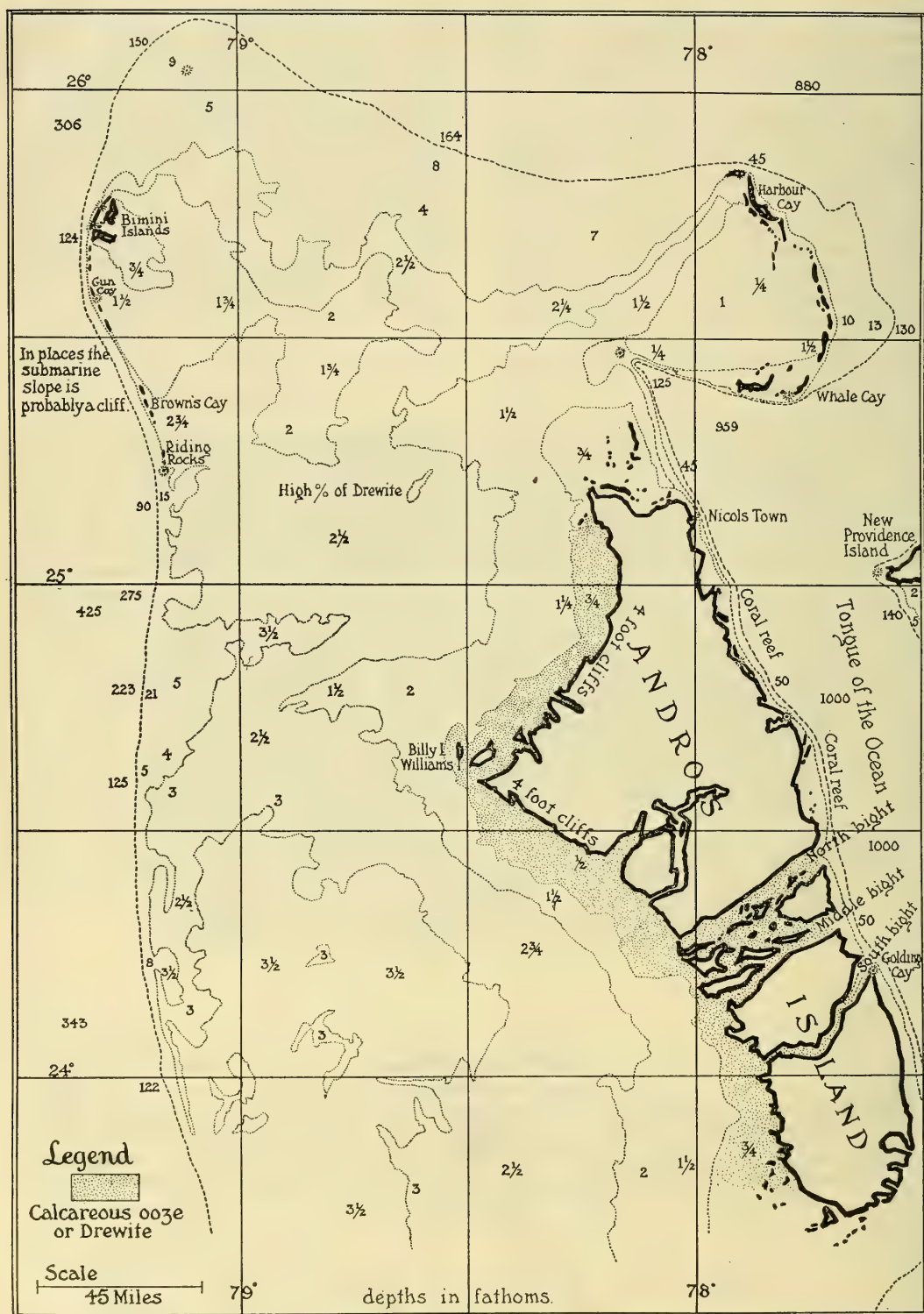
hand, there is much need for new descriptive terms, such as one for the angular constituents of a breccia in contradistinction to pebbles. Such textural and structural terms are as badly needed by the stratigrapher as they are by the student of igneous rocks. All this tends to make the existing literature relatively valueless. The stratigrapher, however, has one great advantage over the pure paleontologist and the student of igneous rocks, because he can study his materials in the making. One cannot expect to watch the actions of a trilobite or the growth of a batholith; the former will never be created again, *Deo volente*, and the latter is a product of hell or some such hypothetical region. By comparing the trilobite with its living descendants, we are reasonably sure that it is an extinct form of arthropod; and we have several theories as to what a batholith is and how it was formed, all of which are founded upon relatively insufficient field and experimental evidence. Perhaps the analogy is too far-fetched but I desire to emphasize two facts: First, we should study processes and origins as well as forms, specimens and classifications; and second, that marine sedimentation is going on where, thanks to modern oceanographical methods, it can be easily observed under extremely variable conditions in different parts of the world. For the above reasons, if for no others, the study of marine sediments is first and foremost a branch of oceanography, just as the study of Paleozoic stratigraphy is largely a branch of paleo-oceanography. How many of our paleontologists and stratigraphers have studied the shallow water marine seas? Is it not true that we know more regarding the geographical distribution of fossils than we do of living forms? What do we really know

about barriers to migration at the present time, or the relation of habitat to bottom benthos? Even considering our researches in continental deposits, is not paleogeography largely dependent upon paleo-oceanography? The correlation of formations is not an end in itself and further, it may defeat its own principles by over-specialization. The time has come for the stratigrapher to stop splitting rocks long enough to go to sea; but he must include in his crew those who are familiar with the maritime type of habitat, and he must insist that his helpmates do not lead him too far beyond his depth into the abyssal deposits.

DESCRIPTION OF MAP

Bimini Islands, Gun Cay, Brown's Cay and Riding Rocks are formed of cross-bedded, calcareous oolites, probably former dunes, now slightly submerged. The western shores of the cays are being actively eroded by the waves with the development of large blocks of oolite which are perched close to the edge of the steep submarine slope. The Great Bahama Bank shallows to the east and on the western coast of Andros there is a broad flat, represented by the stippled area. The surface of this flat is covered by a thin layer of exceptionally pure Drewite which appears to have been derived, in part at least, from the reworking of the unconsolidated Drewite exposed in the little cliffs along the shore. No oolites were discovered in any of the bottom samples in shore deposits except close to the western cays. A large proportion of the sediment in the bottom samples, collected between Gun Bay and Billy Island, is Drewite. The east coast of Andros Island has a well developed reef between Nicalls Town and Golding Cay. Thus the conditions of sedimentation on the east and west coasts of Andros Island are radically different.





^a
CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF
NORTH-EASTERN LABRADOR

By BERNARD HANTZSCH

"Beitrag zur Kenntnis der Vogelwelt des nordöstlichsten-Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechshundfünfzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July, 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II Besonderer Teil (Detailed Part), pages 307-392.

(Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.)

Gavia alba (Gunn.) (p. 321). *Elfenbein-Möve*.—IVORY GULL.

Eskimo: *Naujaluk*, -*lūk*, -*luit* (*Nauja*=gull in general, -*lūk*=poor, perhaps on account of the small size.)

Rather abundant migrant at the beginning of winter, until the ice blockades the coast. If the ice appears late, not until about Christmas time, the creatures often appear in great numbers. If everything is frozen up at the end of October, they occasionally stay quite far from the coast. None of the birds was seen up to the time of my departure on October 12th. In the winter they are seen occasionally on the outer edge of the belt of ice. In the spring, on the other hand, they are seen more rarely. The Canadian *Neptune* expedition, however, is said to have observed specimens of this species in Hudson Strait at the beginning of summer (Low, 1906, p. 315).

Rissa tridactyla tridactyla (L.) (p. 321). *Dreizehen-Möve*.—KITTIWAKE.

Eskimo: *Nautsak*, -*saek*, -*sat* (*Nauja*=gull in general, perhaps connected with -*tsak*, -*tsiak*=pretty, on account of the gracefulness of the bird.)

Common migrant, especially in late summer and fall, often in flocks of many thousands, also appearing during the whole year in scattering numbers. Breeding places, however, do not seem to be located in the neighbourhood. Indeed, Missionary Perrett does not know of a single place of the kind on the whole coast between cape Harrison and Killinek. He observes that he would certainly have heard (p. 322) if colonies of any size existed anywhere (*in litt.*). Contrary to this stands the less dependable statement of Turner, "Breeds plentifully on the northern portion of the Atlantic coast of Labrador" (1886, p. 251). Some Eskimos told me that the birds perhaps breed on the Button islands north of cape Chidley, and I myself found a rather large colony on the bird-mountain at cape Black Buff, Resolution island. The creatures, flying about the rocky wall like a swarm of bees, seemed to be feeding young on July 25th. It is worthy of note

that Kumlien observes that this species, as far as he had any experience, did not breed in Cumberland Sound (1879, p. 100). Colonies of Kittiwakes may thus appear only very sporadically in these regions.

Four specimens of old birds in nearly complete winter plumage (merely the large wing-feathers and some tail-feathers are still the old ones), collected at Killinek from the 12th to 17th of September, proved typical representatives of this subspecies, as did also other specimens examined. There are, indeed, often birds with a distinct nail as long as 2 mm. on the hind toe, and the colour of the feet also goes occasionally from the normal black-brown into dark brown-yellow or brown-red. This, however, is never so light as in the case of younger individuals. The characters given by Stejneger for his Pacific *R. t. pollicaris* and for *R. brevirostris* (Bruch), for example, in Bulletin of the U.S. National Museum, No. 29, 1885, pp. 78-83, were found in none of the Labrador birds examined by me. The measurements of my specimens, 3 females and one doubtful male, are as follows: Weight in the flesh, about 375 g. Total length: about 408 mm. Spread of wings: about 970. Wing: 300-312. Tail: 135-147. Bill: 34.5-39. Tarsi: 29-32. Middle toe including the 8.5-10 mm. long claw: 47-51 mm. Iris: dark brown. Bill: bright greenish-yellow, the inner part burning fiery red. 2 stomachs contained crabs (*Rörig*).

On our trip to Labrador the Kittiwakes were to be seen only now and then, on the return journey, on the other hand the steamer was continuously accompanied from America to Scotland by a great number of birds in adult and juvenile plumage. From the beginning of September, great flocks were seen in the part of the sea at Killinek. It is worthy of note that at first there were only flocks of faded birds, and not until later, young birds with black on the wing-coverts and on the neck. They swam at considerable distances from one another and often covered the sea for a kilometer's distance. Driven up, they whirled about among each other like snowflakes in graceful flight, and gave gratifying proof what numbers of birds are still hatched out in those northern regions which are uninhabited or little inhabited. In general the birds were rather quiet. Their short, excited *Til Tili, Gägägük*, (p. 323) uttered by great flocks, were indeed striking. The Kittiwakes are said to follow the immeasurable shoals of the capelin (*Mallotus villosus*) and then find food in abundance. At other times, however, they are content with crustaceans and all other possible little creatures of the sea. They

are as a rule not very shy around human beings, and therefore are killed and consumed in quantities by the natives.

Larus glaucus Brünn.¹⁸ (p. 323). *Eis-Möve*.
—GLAUCOUS GULL.

Eskimo: *Nauja*, -*jak*, -*jat* (common "gull", used also for the others, especially the larger species. Etymology not clear; according to Fabricius the Greenland *Naia* is connected with *naio*=to look out for, because the birds are always looking for food.

This stately bird is a frequent visitor, but a rather rare breeding bird of our district. Spread-borough found them breeding in the summer of 1896 on the great lakes in Northern Labrador (Macoun, I, p. 34); usually it prefers the shores of islands and coasts. The Canadian *Neptune* expedition obtained eggs of the species at cape Chidley (Low, 1906, p. 315). The bird is also well known in all the places near our district. The scientific observer must be cautious in the identification of this species and of related gulls in life, even if he believes he can recognize them ever so well in the skin.

The younger specimens of *L. glaucus* are very dissimilar in colouration up to the fourth full moult¹⁹, that is to say after the completed third year of their lives.²⁰ I consider the quite light, occasionally almost whitish birds to be those which are just before the first adult plumage moult.²¹

Apparently this colouring is brought about at first partly through the exceptionally strong influence of the sunlight in the spring when the ice and snow are still about. For example, this makes human beings snowblind, colours face and hands of the natives dark brown, bleaches the beautiful fur of the red foxes to pale brownish, and certainly has a very strong bleaching effect on the delicate plumage of the gulls in all degrees

¹⁸*Larus hyperboreus* Gunnerus of the A.O.U. Check-List, 1910.—R.M.A.

¹⁹"bis zur 4. Hauptmauser" seems to be the same as "up to the fourth winter or non-nuptial plumage" of Dwight, "The Gulls (*Laridae*) of the World; their plumages, moults, variations, relationships and distribution," by Jonathan Dwight, M.D., *Bulletin of the American Museum of Natural History*, Vol. LII, Article 3, New York, Dec. 31, 1925, pp. 63-401. See particularly pp. 92-103 for discussion of moults and plumages. For the large gulls, Dwight describes a sequence of ten distinct plumages, beginning with natal down, juvenal, first winter or non-nuptial, first nuptial, and culminating in the fourth nuptial plumage, the latter corresponding to the "adult breeding plumage" of most authors.—R.M.A.

²⁰"nach vollendeten 3. Lebensjahre" is equivalent to the "third nuptial plumage" of Dwight.—R.M.A.

²¹"die vor der 1. Alterskleidmauser stehen" means those which are just coming out of the "fourth winter or non-nuptial plumage" of Dwight into the "fourth nuptial plumage", i.e., into the fully adult breeding plumage. Dr. Dwight's use of the word "nuptial" as applied to the spring and summer plumages of immature or sub-adult gulls is in a limited or technical sense. Inasmuch as we have no authentic records of the large gulls breeding while in immature plumage, the so-called first, second, and third nuptial plumages do not necessarily mean breeding birds. See also "The Sequence of Plumage and Moults of the Passerine Birds of New York", by Jonathan Dwight, *Annals of New York Academy of Science*, Vol. XIII, Lancaster, Pa., 1900, pp. 73-360.—R.M.A.

of age. In zoological gardens, where one can follow up the subject of the moult through the different years, this quite light colouring, as far as I know, is not in general apparent. Yet Dr. Heinroth of the Zoological Garden in Berlin informs me that he has observed in that place a much more apparent bleaching of the plumage in the case of *L. glaucus* than with *L. marinus*, *argentatus* and *ridibundus*.

Two skins of my collection, male and female, apparently moulting out of the second into the third plumage, killed on September 14th at Killinek, show the following measurements: Weight in the flesh: 1625; 1380 g. Total length: 735; 660 mm. Spread of wings: 1550; 1420. Wing: 456; 400 (the first two quills are still quite short). Tail: 225; 205. Tail+wing: 30; 20. Length of bill: 66; 64. Depth of bill: 24; 19. Tarsi: 65.5; 64. Middle toe including the 13 mm. long claw: 78.5; 72 mm. Iris (p. 324): gray, becoming reddish white-gray. Eyelid: pale flesh-colour. Bill: pale grayish and reddish flesh-colour mixed, becoming one-coloured reddish white-gray, dark gray at the tips. Feet: delicate whitish flesh-colour. The two stomachs contained in one instance small stones, remains of crustaceans, remains of fish, stomach and intestines of a small bird (Rörig).

The variation observed in the size of these Northern species of gulls and of biologically similar species, as for example, *Fulmarus*, is very readily explicable to me after my observations on the spot. I consider very sceptically separations within these species which are based only on slight variations in size. The extremely variable weather conditions of those inhospitable regions influence the breeding affairs from the laying of the egg to the flight of the young certainly in a very considerable degree. After our birds, which advance to breeding proportionately early, have finished the nest and have mated, unfavourable weather conditions often occur, so that it is scarcely possible to pick up food near the breeding place, from which the creatures depart unwillingly at this time. The raging storm, perhaps united with rain and driving snow, many a time brings the drift ice back to the coast within a day and blocks it for many miles. Besides, after the storm, thick fog which in these waters frequently sets in for days, possibly covers the whole region, so that the birds like to leave their nesting places still less. Murres and similar species, which go after their food under the water, are not completely hindered in the search in spite of such unfavourable weather conditions. I am of the opinion, however, that our gulls, which are somewhat clumsy in a storm, often for days at a time, do not give to their bodies a sufficient quantity of food, even when they look for it on the land. Conditions of this kind, which in those regions in no way form exceptions, certainly influence the development of the eggs in the maternal body, and later the young still more. Frequently a not inconsiderable portion of the young are destroyed through lack of food, cold, dampness, and other causes, as I observed in North Iceland. When you assume that in the case of *L. glaucus* perhaps two and one-half months pass between the laying of the egg and the young arriving at a state of independence, during which time super-abundance of food now prevails, at other times want prevails,

one will understand the difference in the sizes of the bodies of our birds, which naturally in such large species shows up in the most striking way. Individual predisposition as well as inheritance increases the range of the variation still more. The most favourably situated of the breeding pairs of our species are those which breed separately near the bird-mountain and find food in all kinds of weather in the eggs and young of the cliff birds (Murres, Kittiwakes, etc.). More difficult is the lot of the birds which place their own breeding colonies away from bird-cliffs.

Since the Glaucous Gulls may not attain the age for breeding until after the fourth year of their life is completed, it is to be understood how many younger individuals up to this age are flying around the coasts. In winter they gradually travel southwards, in the spring they return to the north. Then one sees (p. 325) the birds,

mostly in company, fly over the sea or high in the air over the land and look about for food. Or they sit and rest on rocky cliffs and blocks of ice, often dozens together. These younger individuals of our species are, especially in the regions described, the only frequent representatives of the gulls with the exception of *Larus argentatus* [Herring Gull] and *Rissa tridactyla* [Kittiwake]. They immediately attract the attention of the observer by their size, their strong, even if somewhat clumsy, flight, and their sonorous voice, a deep *Gak, Gok, Guklak*. In a fog especially they fly lower than usual and are less shy, flying slowly along the shore, and are then a much-prized piece of game for the natives.

(To be continued)

THE HERPETOLOGY OF HAMILTON, ONTARIO, AND DISTRICT

By J. ROLAND BROWN



HAMILTON, as remarked by a noted herpetologist, must be a wonderful place to collect amphibians and reptiles. In the writer's estimation it is, as twenty-two species are positively known to be present. Two others are rumoured, but up to date they have not been seen by the writer and are therefore not included in this list. Of the twenty-two species, five are Salamanders, six Frogs, one a Toad, six Snakes, and four are Turtles.

Several local habitats have been mentioned in this list. An attempt will be made to explain the location of these in respect to Hamilton. The Escarpment, locally called a mountain, forms the southern boundary of the city. It is about one hundred and fifty feet high with a flat top. The face is partly wooded, partly broken limestone, and partly grass. In the east, about seven miles out, flowing over its edge, are Albion falls. In the southwestern end of the city flowing over its edge are Chedoke falls. Nearly all the specimens mentioned from these two places were collected above the falls. The Bay forms the northern boundary of Hamilton. Valley Inn is at the western part of the Bay. La Salle Park is on the opposite side of the Bay from Hamilton. Dundas Marsh, now a Government Bird and Game Preserve, thanks to the efforts of the Hamilton Bird Protection Society, is in the west of Hamilton.

The list follows with observational notes.

CLASS—AMPHIBIA. AMPHIBIANS.

ORDER—CAUDATA. SALAMANDERS.

FAMILY—NECTURIDÆ

Necturus maculosus. MUD PUPPY.—Fairly common. Found in Hamilton bay, Dundas marsh, and some of the creeks emptying into the Bay. One caught in April last was curled up under a flat rock in a quiet spot in a rather swiftly running stream about a foot from the shore. It did not move when the rock was taken away. It was readily scooped into a net held just in front of it. Not many are caught so easily. They are sometimes caught on the hook in the evenings. No specimens could be induced to eat in captivity. They will live at least three months without any food.

FAMILY SALAMANDRIDÆ

Triturus viridescens viridescens. EASTERN NEWT.—Very common in a secluded pond emptying into the Bay at La Salle park. They stay near the edge in among the fallen brown leaves looking for aquatic insects and worms. From three to six have been caught at one dip of the net. They are also found in Westdale ravine, a low marshy woodland. They have been found in the water in the fall as well as in the spring.

FAMILY AMBYSTOMIDÆ

Ambystoma jeffersonianum. JEFFERSON SALAMANDER.—Uncommon. The tadpoles have been found in the shallow water above Chedoke falls and in a pond by a wood on the top of the Es-

carpment. At Chedoke the egg masses are of a greenish tinge because of the green algæ in the water. Just before emerging from the egg the salamander tadpole has very small front feet about the thickness of hairs. Unlike those of the frog, the salamander tadpoles are carnivorous from the time they hatch. They are cannibalistic in their habits in the tadpole stage, when the larger tadpoles eat the smaller ones. They are very fond of earthworms and the larva of damselflies. If a leg is bitten off by a turtle or other animal a complete new one will grow in its place.

Ambystoma maculatum. SPOTTED SALAMANDER.—Uncommon. One specimen was found beneath a log at Albion falls. They are fond of earthworms. One has been kept in damp moss for nearly a year on an earthworm diet. Spotted Salamander tadpoles are darker in colour than Jefferson Salamander tadpoles.

FAMILY PLETHODONTIDÆ

Plethodon cinereus. REDBACKED OR GRAY SALAMANDER.—Very common under rocks and logs on the face of the Escarpment where one may find as many as three or four together. There are two colour phases of this species. The usual colour, as the commoner name denotes, is grayish black with red on the dorsal surface. Three specimens were found at Albion falls uniformly light red throughout, a very rare phase, whereas on the side of the Escarpment some specimens were found a grayish black throughout. This salamander does not lay its eggs in water. It lays them in a little sac underneath rocks in damp places.

ORDER—SALIENTIA. TOADS AND FROGS

FAMILY BUFONIDÆ

Bufo americanus. AMERICAN TOAD.—Common. Found at Albion and Chedoke falls, along the Bay shore, and on the Escarpment

FAMILY HYLIDÆ

Pseudacris feriarum. EASTERN SWAMP TREE FROG.—Common in the meadows in spring where they keep up a continual chorus for some time unless disturbed. In the later part of the breeding season they are easily caught around evening when they stay very near the edges of the ponds.

FAMILY RANIDÆ

Rana catesbeiana. BULLFROG.—Rare. One young specimen was found this summer at Valley Inn. It is now being kept in an aquarium by the writer.

Rana clamitans. GREEN FROG.—Common. Found at Chedoke and Albion falls. Also found at Webster's falls, Dundas, where they frequent

the shore until disturbed, when they dive into the water emitting a shrill call.

Rana palustris. PICKEREL FROG.—Fairly common at Albion falls. They live in the creek along with *Rana pipiens* and *Rana clamitans*.

Rana pipiens. LEOPARD FROG.—Very common. Found in nearly every pond and creek. They are very thick in the open drain on the top of the Escarpment.

Rana sylvatica. WOOD FROG.—Fairly common about a stream running through a field at Port Nelson, where they can be caught by disturbing the vegetation on the banks

CLASS—REPTILIA. REPTILES.

ORDER—SQUAMATA. LIZARDS AND SNAKES.

SUBORDER—SERPENTES. SNAKES.

FAMILY COLUBRIDÆ

Diadophis punctatus edwardsii. NORTHEASTERN RING-NECK SNAKE.—Uncommon, living under flat stones on the side of the Escarpment in rather damp clay soil. They are very secretive in their habits. None has been observed out in the open either in the grass or on bare ground. Seemingly, they do not seek the sun like *Storeria dekayi* and *Thamnophis sirtalis sirtalis*.

Liopeltis vernalis. SMOOTH GREEN-SNAKE.—Rare. Found under rocks on the grassy face of the Escarpment. This and the preceding species are two of the most beautiful snakes found in Hamilton.

Lampropeltis triangulum triangulum. MILK-SNAKE.—Fairly common. Sometimes found under rocks on the face of the Escarpment although more often around barns on nearby farms.

Storeria dekayi. DEKAY'S SNAKE, BROWN SNAKE.—Common on the face of the Escarpment. They are often found curled up on a rock sunning themselves. They vary in colour from a creamy brown to a chestnut brown. Very young specimens have a white band across the back of the neck resembling in this respect the young of *Diadophis punctatus edwardsii*.

Storeria occipito-maculata. RED-BELLIED SNAKE.—Rare. One young one was found near the Escarpment in the west end of the city.

Thamnophis sirtalis sirtalis. NORTHEASTERN GARTER SNAKE.—Very common on the face of the Escarpment. Five have been found here at one time under one flat stone. Their markings vary considerably. One eight-inch snake found had swallowed an earthworm five inches long. Another of the same length had swallowed a full grown specimen of *Plethodon cinereus*.

ORDER—TESTUDINATA. TURTLES.

FAMILY—KINOSTERNIDÆ

Sternotherus odoratus. MUSK-TURTLE.—Rare. Two were found this summer at Valley Inn on the side of a hill about ten feet from the water. They were probably about to lay their eggs. At other times they seem quite aquatic, only raising the tip of the head out of the water for air. The central part of the plastron, which is pinkish white in colour, is very tender. Even touching it with one's finger nail would cut it. This presumably is one of the reasons why the Musk-Turtle never drags its shell when walking like most turtles do.

FAMILY CHELYDRIDÆ

Chelydra serpentina. SNAPPING TURTLE.—Common at Hamilton in the Bay, marsh, and a secluded pond near La Salle park. They will bury themselves in the mud in shallow water or float on the surface. At La Salle park the pond was covered with duckweed. There was a small bulge in the level carpet of green. The writer became suspicious and placed his net over the bulge pressing downwards and pulling towards

shore all the time. When landed the net contained a Snapping Turtle with carapace eight inches long.

FAMILY TESTUDINIDÆ

Graptemys geographica. MAP-TURTLE.—Common in Hamilton bay where it often suns itself on logs and rocks in the water. It would appear to be more easily preyed upon than most turtles for several were found mutilated. Large pieces were seemingly bitten out of some, one had half its mouth gone, while another suffered from several shot wounds.

Chrysemys marginata marginata. PAINTED TURTLE.—Very common in the same places as *Chelydra serpentina*. At the pond near La Salle park it is common to find about two dozen sunning themselves on floating logs. This pond, while right beside the road, is yet not visible from it because of an intervening hill. By ascending the latter very quietly one may happen upon all these turtles at once. At the slightest noise they splash suddenly into the water and are lost from view in the mass of duckweed that covers the pond.

NOTES AND OBSERVATIONS

TOWNSEND'S WARBLER: A CORRECTION.—In *The Canadian Field-Naturalist*, 40:65, 1926, Mr. Frank Farley records the taking of a Townsend's Warbler, *Dendroica townsendi* at Miquelon Lake, Alberta, citing me as authority for identity. I have had occasion to examine this bird more closely with material for comparison and I now find it necessary to correct my first determination. The specimen proves to be a juvenile male Black-throated Green Warbler, *Dendroica virens* in a plumage very closely resembling *townsendi* of similar age. The specimen has an unusually complete facial or aural patch and the yellow is richer than normal. While the likeness is suffi-

cient to cause confusion in the field, where the above determination was made, comparison of specimens shows less sharpness in development of the facial patch, paler yellow on the face and a distinctly less yellow suffusion over the throat than in Townsend's Warbler. As far as I know, the only records for Townsend's Warbler in Alberta are:—Mount Edith Cavell, Jasper Park, September 6, 1917; Banff, August 28, 1894, and August 13 and 19, 1898. It is to be noted that these are all in the mountains and the species has not yet been detected even in the lower foothills.—P. A. TAVERNER.



OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

Published by Authority of the National Parks of Canada Branch, Department of the Interior, Canada

In the following returns upon banded birds it will be noted that some returns may be thought to indicate, from the date of capture, violations of the Migratory Birds Act of Canada and the United States. The great majority of returns, which seem to indicate violations, are from birds accidentally caught in traps set for fur-bearing mammals, from birds caught in fish nets, killed by oil, or from birds found dead from unknown causes. Appropriate action has been taken in connection with the few returns which indicate illegal shooting.

RETURNS UPON BIRDS BANDED IN 1925

BLACK DUCK, No. 323,849, banded by H. S. Osler, at Lake Scugog, Ontario, on September 25, 1925, was killed on Moon Lake, two miles west of Lula, Mississippi, on December 21, 1926.

BLACK DUCK, No. 323,868, banded by H. S. Osler, at Lake Scugog, Ontario, on September 26, 1925, was captured on the Virginia side of the Potomac River, north of Four Mile Run, shortly before December 2, 1926.

BLACK DUCK, No. 323,879, banded by H. S. Osler, at Lake Scugog, Ontario, on September 26, 1925, was shot at a place three miles east of Waterville, Quebec, on the Coaticook River, about the middle of October, 1926.

BLACK DUCK, No. 323,982, banded by H. S. Osler, at Lake Scugog, Ontario, on October 2, 1925, was killed at a place near Detroit, Michigan, on December 25, 1926.

BLACK DUCK, No. 389,301, banded by H. S. Osler, at Lake Scugog, Ontario, on October 3, 1925, was shot in Tuckerton Bay, off Beach Haven, New Jersey, about January 5, 1927, and reported as a male.

BLACK DUCK, No. 389,340, banded by H. S. Osler, at Lake Scugog, Ontario, on October 4, 1925, was killed on the Great Kanawha River, at Arbuckle, West Virginia, on December 25, 1926.

BLACK DUCK, No. 389,379, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1925, was killed in one of the creeks near the Cape Fear River, about three miles from Wilmington, North Carolina, on January 8, 1927, and reported as a female.

BLACK DUCK, No. 389,396, banded by H. S. Osler, at Lake Scugog, Ontario, on October 8, 1925, was shot on Lake Erie, near the Pt. Mouille Gun Club, in the vicinity of the Detroit River Lighthouse, on November 19, 1926.

BLACK DUCK, No. 389,410, banded by H. S. Osler, at Lake Scugog, Ontario, on October 11, 1925, was killed on Bay Point, about twenty miles from Port Royal, South Carolina, a few days before Christmas, 1926.

BLACK DUCK, No. 389,446, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1925, was shot at Long Point Bay, on the north shore of Lake Erie, Ontario, on November 7, 1927.

BLACK DUCK, No. 389,475, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1925, was killed at Port Rowan, Long Point Bay, Lake Erie, Ontario, on November 21, 1927.

BLACK DUCK, No. 389,496, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1925, was killed at a place about fifty miles from the mouth of the Scioto River, Ohio, on November 12, 1926, and reported as a male.

BLACK DUCK, No. 389,024, banded by H. S. Osler, at Lake Scugog, Ontario, on October 18, 1925, was killed on the St. Francis River, Craighead County, Arkansas, on December 7, 1926.

BLACK DUCK, No. 389,032, banded by H. S. Osler, at Lake Scugog, Ontario, on October 18, 1925, was killed at Big Lake, Mississippi County, Arkansas, during the latter part of November, 1926.

BLUE-WINGED TEAL, No. 323,756, banded by H. S. Osler, at Lake Scugog, Ontario, on September 24, 1925, was shot in San Francisco Bay, near Burlingame, California, on December 12, 1926.

PINTAIL, No. 367,402, banded by Frank W. Robl, at Ellinwood, Kansas, on February 17, 1925, was shot at a place about four miles west of Ellinwood, Saskatchewan, on or about October 4, 1926, and reported as a male.

PINTAIL, No. 105,710, ♀, banded by F. W. Robl, at Ellinwood, Kansas, on February 27, 1925, was shot at Last Mountain Lake, about twelve miles west of Govan, Saskatchewan, on October 31, 1927.

PINTAIL, No. 367,025, banded by Frank W. Robl, at Ellinwood, Kansas, on March 4, 1925, was shot on the western shore of Vale Island, Great Slave Lake, in the delta of the Hay River, Northwest Territories, during the latter part of August or September, 1925.

PINTAIL, No. 367,090, banded by Frank W. Robl, at Ellinwood, Kansas, on March 19, 1925, was picked up dead on the road allowance east of Section 19, Township 10, Range 7, West of the 3rd Meridian, at a place about two miles northwest of Ville Bouvier, Saskatchewan, on April 17, 1927.

CANADA GOOSE, No. 237,904, yg., banded by I. S. Adams, at La Batture aux Loup-Marins, in the St. Lawrence River, opposite L'Islet, Quebec, on October 18, 1925, was killed at Green Run, Worcester County, Maryland, eighteen miles south of Ocean City, on January 6, 1927.

BLACK-CROWNED NIGHT HERON, No. 336,649, banded by Benjamin S. Harrison, at Bourne, Massachusetts, on June 9, 1925, was found wounded at Shippigan, Gloucester County, New Brunswick, between July 15, and 30, 1927. The bird failed to recover and died.

RUFFED GROUSE, No. 227,853, ad., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on March 18, 1925, was shot near the place where it was banded, on October 4, 1926.

FERRUGINOUS ROUGH-LEG, No. 235,814, fig., banded by C. M. Sternberg, at Red Deer River, west of Rumsey, Alberta, on June 25, 1925, was "found" and had its band removed on the prairies, about ten miles southwest of Benkelman, Nebraska—reported on November 7, 1927.

CROW, No. 376,837, nestling, banded by Theed Pearse, on Denman Island, Vancouver Island, British Columbia, on June 12, 1925, was shot at Seal Island, near Union Bay, British Columbia, on May 9, 1927.

PURPLE FINCH, No. 43,662, banded by George H. Priest, at Brockton, Massachusetts, on-

February 1, 1925, was trapped and had its band removed at Loretteville, about six miles north west of Quebec City, Quebec, on May 14, 1927.

RETURNS UPON BIRDS BANDED IN 1926

MALLARD, No. 226,903, ♀, banded by J. W. Clise, Jr., at Sequim, Washington, on January 3, 1926, was killed at Sumas Prairie, British Columbia, on December 9, 1926.

MALLARD, No. 409,029, ad., banded by F. C. Lincoln, at Bath, Illinois, on January 6, 1926, was shot in Netley Creek, at the southern end of Lake Winnipeg, Manitoba, on October 24, 1927, and reported as a male.

MALLARD, No. 409,062, banded by F. C. Lincoln, at Bath, Illinois, on January 6, 1926, was shot by a resident of Kenaston, Saskatchewan, on October 5, 1927.

MALLARD, No. 409,084, ad. ♂, banded by F. C. Lincoln, at Bath, Illinois, on January 6, 1926, was shot on Section 12, Township 15, Range 4, West of the 2nd Meridian, Saskatchewan, on May 7, 1927.

MALLARD, No. 409,089, banded by F. C. Lincoln, at Bath, Illinois, on January 6, 1926, was shot by a resident of Dafoe, Saskatchewan, about seven miles southwest of Big Quill Lake, shortly before September 26, 1927, and reported as a male.

MALLARD, No. 409,182, banded by F. C. Lincoln, at Bath, Illinois, on January 7, 1926, was shot on the Valley River, Indian Reserve, forty miles northeast of Dauphin, Manitoba, on April 29, 1927, and reported as a male.

MALLARD, No. 409,355, banded by F. C. Lincoln, at Bath, Illinois, on January 8, 1926, was shot by a resident of Belmont, Manitoba, on October 18, 1927.

MALLARD, No. 409,363, banded by F. C. Lincoln, at Bath, Illinois, on January 8, 1926, was shot on the banks of the Battle River, four miles west of Battleford, Saskatchewan—reported on October 17, 1927.

MALLARD, No. 409,455, ad. ♂, banded by F. C. Lincoln, at Bath, Illinois, on January 8, 1926, was killed on Section 33, Township 27, Range 28, eight miles north of Roblin, Manitoba, on May 23, 1927.

MALLARD, No. 409,570, banded by F. C. Lincoln, at Bath, Illinois, on January 8, 1926, was shot in Section 7, Township 16, Range 25 West, Manitoba, on September 15, 1927.

MALLARD, No. 409,594, ♂, banded by F. C. Lincoln, at Bath, Illinois, on January 8, 1926, was shot at a place near Donny Brook, Saskatchewan—reported October 15, 1927.

MALLARD, No. 409,736, banded by F. C. Lincoln, at Bath, Illinois, on January 11, 1926, was shot at Ladder Lake, one mile north of Big River, Saskatchewan, during the month of October, 1926.

MALLARD, No. 409,917, ad. ♂, banded by F. C. Lincoln, at Crane Lake near Bath, Illinois, on January 13, 1926, was killed at a small lake west of the southwest arm of Deschambault Lake, Saskatchewan, about May 20, 1927.

MALLARD, No. 418,360, banded by John Broeker, at Portage des Sioux, Missouri, on February 22, 1926, was shot at a place about eight miles north of Montmartre, Saskatchewan, on September 15, 1927.

MALLARD, No. 305,265, ♀, banded by John Broeker, at Portage des Sioux, Missouri, on March 12, 1926, was found dead on Section 6, Township 22, Range 7 West, at a place about three miles northwest of Scotch Bay, Lake Manitoba, Manitoba, on May 24, 1927. From the appearance of the bird's body, it was probably killed during the fall of 1926.

MALLARD, No. 305,273, banded by John Broeker, at Portage des Sioux, Missouri, on March 13, 1926, was shot at Morse, Saskatchewan, on October 14, 1926.

MALLARD, No. 332,719, ad., banded by F. W. Robl, at Ellinwood, Kansas, on March 13, 1926, was shot in the little Touchwood Hills, north of Punichy, Saskatchewan, towards the end of September, 1927.

MALLARD, No. 300,649, banded by T. E. Musselman, at Scobey Lake, Missouri, on March 15, 1926, was shot on Oak Lake, Manitoba, about October 20, 1926, and reported as a female.

MALLARD, No. 300,675, ♀, banded by T. E. Musselman, at Scobey Lake, Missouri, on March 17, 1926, was shot on a point of the Qu'Appelle Lakes, fifteen miles west of Fort Qu'Appelle, Saskatchewan—reported on November 9, 1927.

MALLARD, No. 300,691, banded by T. E. Musselman, at Scobey Lake, Missouri, on March 22, 1926, was shot at Dundurn, Saskatchewan, about November 1, 1927.

PINTAIL, No. 367,249, banded by F. W. Robl, at Ellinwood, Kansas, on March 25, 1926, was "taken" and had its band removed at Sandy Bay Indian Reserve, near Amaranth, Manitoba, shortly before April 20, 1927.

LESSER SCAUP DUCK, No. 321,445, banded by S. M. Batterson, at Mohler, Oregon, on January 22, 1926, was shot at Esquimalt Harbour, near Victoria, British Columbia, on November 27, 1927.

RED-TAILED HAWK, No. 309,016, yg., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on June 20, 1926, was killed at Butterfield, Minnesota, on October 12, 1926.

BREWER'S BLACKBIRD, No. 346,373, ad. ♀, banded by P. S. Walker, at Point Grey, British Columbia, on May 8, 1926, was found dead in the same locality, on May 4, 1927.

BRONZED GRACKLE, No. 288,351, banded by E. A. Doolittle, at Painesville, Ohio, on April 17, 1926, was shot at Hamilton Beach, Ontario, eleven miles from Hamilton—reported on September 14, 1927.

BRONZED GRACKLE, No. 463,185, ad., banded by W. Philip Gerald, at Fredericton, New Brunswick, on June 22, 1926, was shot in the same locality, on May 17, 1927.

TREE SWALLOW, No. A69177, banded by Philip F. Foran, at Ottawa, Ontario, about May 10, 1926, was found, probably injured by a cat, at 78 Aberdeen Street, Cummings Bridge, Ontario, on June 18, 1927. The bird was cared for at 406 Queen Street, Ottawa, but died two days later.

ROBIN, No. 19,249, juv., banded by J. Robert Morton, at North Kildonan, Manitoba, on June 24, 1926, was picked up dead in East Kildonan, Manitoba, one and one-half miles from the place where it was banded, on May 14, 1927. From the appearance of the body, the bird had probably been dead for some time.

PAID-UP MEMBERS OF THE OTTAWA FIELD-NATURALISTS' CLUB, MAY, 1927

*Members are requested to notify the Editor of any errors or omissions
which they may detect in this list.*

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THE EARLY INDIAN WILDFOWLER OF VANCOUVER ISLAND

By G. D. SPROT

EVER SINCE, as a small boy in Scotland, I set my first bird snare, and netted the ivy-clad walls surrounding the stables and gardens of my home for sparrows, I have been interested in the many devices employed for the capture of birds in the several countries that it has been my good fortune to visit.

Such observations as I made, were made I must admit, only on those occasions when I actually came in contact with, or was informed of, some ingenious weapon or method of netting or trapping, so that on my arrival on Vancouver Island in 1908, and without making any very diligent search, I presumed that although other and more primitive Indian devices for securing birds must have at one time or another existed, they were certainly not to be found in use at the present time, for the Indian of to-day seemed perfectly content with drifting idly into a bunch of duck in a fir-bough covered canoe, and "brown-ing" them forthwith with powder and shot in that dull and uninteresting manner of the modern pot-hunter.

However, my interest was later aroused, when one day whilst in search of shore-birds near the mouth of the Chemainus river I came across two tall poles standing two hundred or more yards apart; one on dyked-off land, standing high and dry; the other on the tidal flat beyond. This pole was considered a danger to stock and was unfortunately cut down by the farm owner in February, 1928. It was quite sound. On examining the more accessible of these two poles, I found it to be of Red Cedar (*Thuja plicata* Don.), about 70 feet high, and about 42 inches in circumference at ground level. Owing probably to its former periodic immersion in salt and fresh water alternately—the salt no doubt toughening the fibres of the wood whilst the fresh water insured a freedom from Teredos—this pole was well preserved, but on account of drainage and the subsequent settlement of the soil, it has developed a lean of several degrees from the perpendicular; the pole to seaward of the dykes however stood perfectly erect. At first sight of these poles I might well have remarked as did

Vancouver when he first sighted similar ones in 1792 on the shores of what is now the State of Washington, "They did not contribute the least instruction of the purpose for which they were intended," had I not suspected that purpose from what I had already read and witnessed of flight-nets in other climes. On enquiry from the owner of the land on which these poles stand, I was informed that they are just as they were when he, the owner, first came to the country in 1862. I was also informed that the butts of others had been found along the line, but nothing was known of when they had been in action last. There seems no doubt therefore that these two poles were erected at least seventy if not perhaps a hundred years ago, and had then taken part in supporting the mighty nets that entangled the many ducks and geese that eventually found their way to the larder of the Chemainus Indian.



Plate 1—Showing the two poles as they stood prior to 1928. 23

It appears that the Indians of Vancouver Island employed several distinct methods of handling nets in the capture of ducks and geese, and I give these here under separate headings, and just as they have already been described by

the early explorers themselves, or, as in the case of the Chemainus nets and "Drop net" just as described to me by Mr. F. Price of Duncan and Mr. J. H. Hillier of Ucluelet, leaving readers to picture for themselves the wild night scenes that must have accompanied such practises.

THE FLIGHT NET

Mr. F. Price of Duncan who is well acquainted with the Chinook jargon, kindly obtained for me the following information concerning the handling of the Chemainus nets, from an old Indian of that district. "Ropes were run through bone rings, which latter were fixed to the tops of the poles so that the nets might be sharply lowered as the ducks swept into them, by an Indian posted at the foot of each pole and hidden by a circle of brush."

As far as I can gather from the writings of others, the nets of other tribes at all times remained erect, and the birds striking them "fell to the ground", "became entangled", or "were shot down by arrows". This dropping of the net does not appear to have been mentioned before, unless Wilkes' remarks "by which they are thrown to the ground" might be interpreted as meaning the dropping of the net, which seems doubtful, but there may have been good reason for the Chemainus Indian adopting such a method, for in those areas much frequented by Geese and Swans, such as the Chemainus Flats were said to be at one time, tremendous damage to the nets would have resulted if they were not instantly released as these heavy birds struck them.

These nets were said to be made of "hemp", probably what is known as Indian Hemp (*Apocynum cannabinum*) or the Common Nettle (*Urtica lyallii*) which are both commonly used for such purposes.

The breast feathers of all ducks taken in this manner were mixed with the feathery remnants of the flowers of the Spirea (*S. discolor* Pursh.), also probably Fire-weed or Willow Herb (*Epi-lobium angustifolium*, L.) as was largely used by other tribes. These when worked together made what must have been very light and no doubt very warm blankets.

The only other record that I have been able to find of the use of flight-nets on Vancouver Island is in Hill-Tout's *British North America*, 1907, in which we are told that the nets used by "one of the Vancouver Island tribes was of wide mesh, and the birds entangled were captured or shot down by arrows." The original author of this statement is unfortunately not referred to. The Chemainus poles already mentioned, being co-

nected with this method remain, however, sufficient proof that the practise certainly existed on the Island. It is very doubtful whether the Vancouver Island west coast Indians ever used the flight-net or we should certainly have heard of it from one or other of the many navigators who visited there. As I am unable to trace any other authentic account of the use of such nets on Vancouver Island, it is probable that the practice died out earlier here than elsewhere in the Sound area, for Paul Kane witnessed similar nets in action as late as 1859 on the Washington shores of the Straits of Juan de Fuca and almost opposite Victoria, B.C. He informs us that a net was stretched in a narrow valley to intercept the duck as they flew in from the sea, adding that a "smoky fire is made at the bottom of the net which prevents the duck from seeing it, and when they fly against it they become confused and fall down." Other poles in the vicinity of Orcas Island were seen by E. T. Coleman in 1869, but there is nothing in his account to show whether they were then in use or no, so that for the present we must consider Kane as the latest writer to witness the nets in actual use and probably one of the very few whose description is really first hand. There are several descriptions by others, but not as eye-witnesses.

Wilkes in 1841, Dr. J. Scouller in August, 1825, and Vancouver in 1792, all describe the same lot of poles—at Dungeness on the Washington shores, and of these Vancouver is the only one who gives a really detailed description of them which description is also accompanied by an excellent engraving, but knowing nothing of their purpose he imagined that the circles of blackened stones that he found between them were for cooking purposes, on account of their similarity to the "cooking places" of the South Sea Islanders. Paul Kane explains their use when he speaks of "smoky fires to hide the nets" and Wilkes tells us that "fires are then lighted which alarm the birds and cause them to fly against the nets by which they are thrown upon the ground."

THE DIP NET

The Indian method of securing Brant at Fort Rupert, on the northeast coast of the island has been well described by Dr. Hassell in the *History of Fowling*, as follows:—"A dark, wet, still night is chosen in the winter when the Geese are feeding on the beds of *Zostera* in shallow water. Two Indians go out in a canoe, one in the bow armed with a torch of resinous pine splinters known as a 'Gun-Stick', ['Gun' is probably a misprint for 'Gum', the name in general use at the present

day.—G.D.S.] and a large net like a landing-net on a pole; the other sits in the stern and paddles the canoe in the direction of a flock of Brant. As soon as the canoe has got in amongst a flock the torch is suddenly lighted and as suddenly extinguished. The birds at once get up and fly about a short distance but settle again as soon as the light disappears. The Indians mark the direction taken by the birds; and follow them, again paddling noiselessly into the flock. The torch is again lighted and extinguished with the same result. After this manoeuvre has been repeated some three times the Geese become bewildered. When the torch is lighted they do not attempt to fly but stay and gaze at it. They are then quickly scooped out of the water by the Indian with the net”.

THE DROP NET.

Mr. G. Fraser of Ucluelet tells me that about twenty years ago he was forced by rough weather to take shelter with some Indians at Toquart on the west coast of the island, and that they brought in during the night some fifty ducks and geese, which they told him had been taken in a net stretched between two canoes. Mr. J. Hillier, also of Ucluelet, informs me that about that time—twenty years ago—he had on several occasions seen the Indians working the net, and he described to me the mode of capture thus:—“Two canoes were used, each manned by three Indians; one in the bow kept burning a fire of finely split Gum-wood, number two worked the net, whilst number three handled the paddle. The canoes would go out into Toquart harbour on a dark, stormy night at a time when the geese were going north, for on such nights they frequented this sheltered harbour in large numbers. As the canoes approached the geese, a blanket was held up behind the fire by the man in the bow. Seeing only the fire, the geese would huddle together, when the canoes would pass, one on each side, and drop the net over them.”

I have been unable to trace any written reference to this two-canoe method, and I therefore presume it to be, perhaps a more later day improvement on the single canoe hand-net described by Jewitt and others as being used entirely on the west coast of the island and which was dropped over the birds in the same manner. The manner of approach when using the single hand-net was similar in every detail to that recounted by Mr. Hillier. The net measured about 10 feet by 4 feet. Jewitt gives this net as made of bark (see Plate 2).

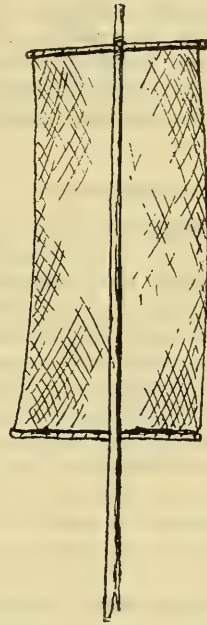


PLATE II.—Single-handed Goose-net from Nootka.

BIRD LIME

Not to be outdone by their elders, the younger generation of Indians sought out the large wood slug (*Limax*) and by coating twigs with its slime, they would catch the Rufous Hummingbird (*Selasphorus rufus*). Mr. Hillier tells me that at about the same time that he witnessed the capture of the geese, already described, he had an Indian working for him digging a garden, which was surrounded by Salmon-berry bushes, over which Hummingbirds were hovering in considerable numbers. When Mr. Hillier remarked on the beauty of the birds, the Indian offered to show him how to catch them. Looking about in the grass he soon located a slug and stroking its back with a stick until it was well covered with slime, he selected a slight and prominent limb of a nearby bush, then smearing the slime over it, he backed away and in a very short time a bird settled thereon and was held fast. Mr. Hillier informs me further that the one coating was sufficient to catch a number of birds before he broke the twig off. Dr. Hasell also mentions this method of taking Hummingbirds, adding that the Indian youths “catch these aerial gems solely for the purpose of teasing them, threading a horse-hair through their nostrils to prevent their escaping”.

In a list of birds from Vancouver Island by Dr. Wood of H.M.S. *Hecate* (British Columbia

and Vancouver Island Comm.; R. C. Mayne 1862, p. 417) under the heading of Hummingbirds the following note appears: "The Indian boys snare them in numbers and fastening a dozen or more to a stick by one foot, bring them off alive to the ships for sale."

SNARES

In the possession of Mr. W. A. Newcombe of Victoria, B.C., are several snares, which he informed me were used for shore-birds. One that interested me especially came from Barclay Sound. A length of cedar bark, plaited, had inserted in it at about every nine inches a portion of dogfish spine about 14 inches long. To this is attached by threads of cedar bark, a noose of twisted human hair. Another of the same type, which Mr. Newcombe informed me had come from Storm Island, Queen Charlotte Sound, had the springs of whale-bone instead of dogfish spine, but was in every other respect the same.

MISCELLANEOUS WEAPONS

The bow and arrow were, of course, in general

use at one time, by the Indians of Vancouver Island.

The bows of the Cowichan Indians, of the east coast, were of the same width throughout, rounded on one side, with the tips curving forward; flat on the reverse side. The bows of the west coast Indians of the island are wide in the centre narrowing towards the tips, being "originally characteristic of the west coast Indian." (Vide F. Boas, *The Kwakiutl of Vancouver Island*, Jessup, N. Pac. Exp., Vol. 5, Part 4, p. 513.) Several types of arrows were used. Plate 3, Fig. 1, shows a type used by the Cowichan Indian with spiral feathering. Plate 4, Fig. 1, shows an arrow-head of stone. Figs. 2 and 3 show two types of wooden heads, dull pointed for stunning birds.

A four-pronged spear (Plate 3, Fig. 2, from Cowichan) was also used for duck, probably on such occasions as have already been related, when a light was used in a canoe or for securing duck around the flight-nets. The duck were held within the prongs, the feathers catching on the barbs and detaining them. This spear was from 10 to 12 feet long over all.

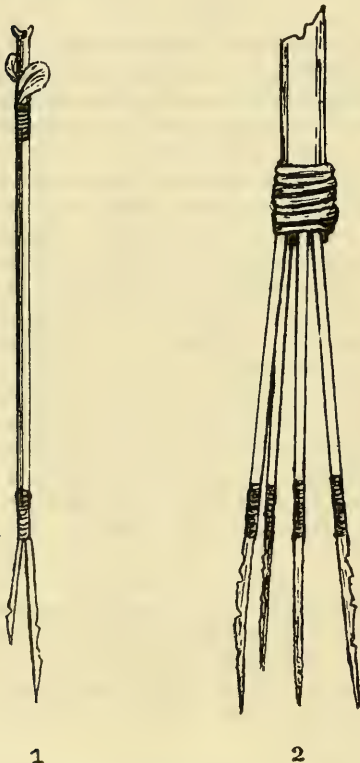


PLATE 3. FIG. 1. Duck Arrow.
FIG. 2. Duck Spear.—Both from Cowichan.

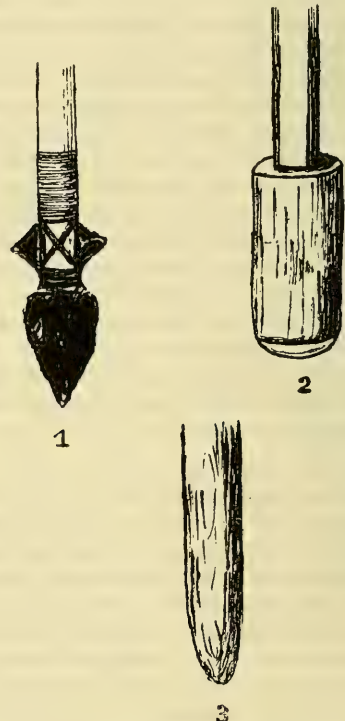


PLATE 4. FIG. 1. Stone arrow-head.
FIG. 2-3. Wooden arrow-head.

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I desire to express my thanks to Mr. W. A. Newcombe who not only gave me the full use of his late father's and his own personal notes, library and collections, but with his knowledge and understanding of the manners and customs of the Island Indians was of the greatest assistance to me in the compilation of these few notes. I am indebted also to those whose names already appear in the text as contributing valuable notes.—G. H. Sprot, Cobble Hill, Vancouver Island, B.C.

NOTES ON THE INTRODUCTION OF THE PHEASANT IN SOME OF THE PROVINCES OF CANADA.

By HOYES LLOYD.



HEASANTS, particularly the English Pheasant, *Phasianus colchicus colchicus* and the Ring-necked Pheasant *P.C. torquatus* and intergrades, have long been in the process of introduction in various parts of Canada and in a few localities they have become thoroughly acclimatized and afford an addition to the game bird supply. The story of the introduction of the Pheasant in British Columbia is apparently long and complicated and as those who are more competent to deal with the subject are endeavouring to record the details I will not presume to speak of its introduction here. A few notes have come into my possession respecting the introduction of pheasants elsewhere in Canada and I am publishing these in *The Canadian Field-Naturalist* for the purposes of record. Possibly this action may encourage others who have additional information on the subject to make it available for natural history readers before the passage of time obliterates memories and casual records on this important subject.

SASKATCHEWAN

Mr. F. Bradshaw, Game Commissioner, Regina, Saskatchewan, has furnished me with the following notes:—

"Mr. James Harrison of Fort Qu'Appelle, Saskatchewan, secured fifty pheasant eggs from the Province of Ontario in March, 1925. Thirty-eight birds were hatched out, three died and thirty-five were liberated and came

through the winters of 1925 and 1926 in good shape. During the summer of 1926 a few nests were seen in the Valley, also quite a number of young were to be seen in the town. During the past winter very few of these birds have been observed. About two weeks ago (January, 1927), Mr. Shute, Provincial Game Guardian, Fort Qu'Appelle, saw two female birds near the station at Fort Qu'Appelle, and on February 2nd, he saw two more female pheasants about six miles north and east of Fort Qu'Appelle. Mr. Harrison states that he has not seen any pheasants for a long time."

ONTARIO

I am indebted to H. W. Hunsberry of Jordan Station, Ontario, for the following information respecting the introduction of the pheasant in Ontario,—

"Mr. August Fleischman of Buffalo, N.Y., who spends his summers at his home in Niagara-on-the-Lake introduced these birds to the Niagara District in 1897 having secured two pairs from a dealer in New Jersey.

"Mr. Oliver Taylor of the same town (Niagara-on-the-Lake) a warm friend of Mr. Fleischman's had the personal supervision over the rearing of the young birds and as soon as they were large enough to look after themselves, they were liberated in beautiful Chateauguay Park adjoining the town and that small bevy was the beginning of the thousands which now roam the Niagara Peninsula.

"The first open season for pheasants in the Niagara District (County of Lincoln) was from October 15th to November 15th, 1910. Thou-

sands were shot during the first few days of the open season and in spite of the prolonged open season the government declared the same open days again in 1911 which fact alone must satisfy you of the rapid rate at which these birds multiply.

"In 1912 the open season was for two days only, then later on, one day. Prior to 1923 the season was closed for two consecutive years, but this precaution did not seem to cause any great increase in their numbers.

"In 1924 the season was opened for two days, viz., the last two Thursdays in October and the birds were quite plentiful.

"Last year (1925) there was only one open day, Saturday, November 14th, and notwithstanding that the country-side was over-run with hunters from all over Ontario (the bags generally being of the limit) the birds seem as numerous this summer as in former years.

"All hunters coming to shoot in Lincoln, Welland or Wentworth Counties next fall (1926) must purchase a gun license (\$2.00) before they may legally hunt in the above counties.

"It may be of interest to you to learn that I first brought the matter of a gun license before the Parliamentary Fish and Game Committee at Toronto in 1921 and after battling for the next four years was successful in having my suggestion incorporated by the Department in the Fish and Game Laws."

Mr. J. H. Fleming of Toronto, Ontario, has furnished me with the following notes,—

"The Pheasant introduced into the Niagara District is the Ring-necked Pheasant *Phasianus colchicus torquatus*, not the English intergrade between the two subspecies *Phasianus colchicus colchicus* and *P. c. torquatus*. The term 'Mongolian Pheasant' was formerly used for the Ring-necked Pheasant imported from China.

"McNab P.O., Township of Grantham, Niagara District, May 15, 1909, I found pheasants numerous here. I saw three cock birds and one hen in a field and heard cocks crowing everywhere. They seemed very tame and I must have seen nearly a dozen during the day. The males seemed lighter on the back than the English Pheasant and I fancy the stock is derived from the Ring-necked Pheasant.

"October 15, 1910.—To-day was the first open shooting for pheasants in Ontario, three of us put up about twelve birds during the day, of these only one was a hen. We shot four cock birds all in excellent condition, and missed or lost four more. They are excellent shooting, getting onto the wing with a rush, and usually going off at close range from cover. We had no dogs to flush them, and no doubt the hens were lying close, and being inconspicuous, escaped."

Mr. Fleming says that the English Pheasant *Phasianus colchicus colchicus* X *P. c. torquatus*

or its eggs have often been introduced into the Niagara Peninsula but this stock has never become acclimatized. He considers that the Fleischman introduction of 1897 did not result in successful acclimatization. He has been passing through Niagara-on-the-Lake at intervals since 1907 and going to McNab in Grantham Township on the Lake Shore Road. According to his observations the Pheasants worked their way east from the vicinity of St. Catharines after 1907 and ultimately reached Niagara-on-the-Lake. These birds were Ring-necks (*torquatus*) the hens of which have been successful in raising their broods and any previous introductions failed because the stock was *colchicus*, the hens of which have failed to hatch their eggs.*

Dr. Geo. T. McKeough of Blenheim, Ontario, recorded the fact that the English Pheasant had become plentiful in the southern portion of his County, in *The Canadian Field-Naturalist*, Vol. XXXVIII, pp. 188-9, December, 1924. He gives Mr. Goldworthy, Park Superintendent, Rond Eau, much praise for liberating, distributing and subsequently caring for these birds, and from his statement it appears that the birds liberated by Mr. Goldworthy and others secured from the late Mr. Wm. Chaplin of St. Catharines, were the parent stock for an extensive colony that inhabits the fields adjacent to Lake Erie, near Blenheim.

Mr. Gregory Clark in *The Toronto Star* of November 21, 1925, has the following to say on the introduction of pheasants in Ontario,—

"The first pheasants were introduced into the Peninsula by an Englishman named Furminger, whose sons are amongst the best shots in the peninsula to-day. Mr. Furminger brought out the parent birds and released them. Then when they began to flourish, Mr. Welland Woodruff, M.P., continued the good work by planting eggs in several parts of the Peninsula, about 1908 and later. The birds have flourished marvelously since, and this is the fourth year the government has permitted the shooting of them."

Apparently Mr. Clark was misinformed about the year in which shooting of pheasants became legal for we have definite evidence that there was an open season in 1910.

The Department of Game and Fisheries for the Province of Ontario has been exceedingly active of late years in distributing pheasant eggs, and, no doubt, many recent occurrences of the species in areas where it has not previously been found are traceable to this distribution.

* I remember seeing one bird near Niagara-on-the-Lake in the early summer of 1911.—H.L.

QUEBEC

I am indebted to Mr. J. A. Bellisle, Superintendent Fish and Game Branch, Department of Colonization, Mines and Fisheries, Quebec, for the following information,—

"In 1915, the Government of the Province of Quebec had succeeded in securing a few couples of Pheasants which were left free in the Laurentides National Park; in the meantime a Regulation was passed forbidding the hunting or killing of these birds, or the disturbing or collecting of their eggs. However, due to the severity of our winter, or lack of food (the latter seeming to be the real cause), all these birds disappeared.

"In 1923, we were informed that quite a few pheasants were seen in the counties of Huntingdon and Chateauguay, coming very likely from the Province of Ontario. A new Regulation was passed forbidding, for a period of five years, the hunting or killing of them, or the taking of their eggs. In that Section of the Province, where the climate is not so severe, they might survive. Unfortunately, on account of scarcity of food in the woods, they were seen to be looking for same in the vicinity of farms, and, consequently, were much exposed to destruction. This could explain their decrease in number last year."

NEW BRUNSWICK

Mr. R. W. Tufts tells me that—

"The liberation of nine Ring-necked Pheasants, six hens and three cocks, near Rothesay, New Brunswick, during March, 1926, constitutes the first attempt at introducing this species into New Brunswick, so far as he has been able to ascertain.

"This introduction was undertaken by Mr. J. M. Robinson of Rothesay who reports that while the adult birds were seen from time to time during the summer following, no young were noted."

NOVA SCOTIA

Mr. Tufts has referred me to an *Annotated List of the Birds of Yarmouth and Vicinity* from the Transaction of the Nova Scotian Institute of Science, published January 5th, 1916, by E. Chesley Allen where under *Ring-necked Pheasant*, the following account occurs:—

"A number of these birds, fifty or more, have been liberated here during the past five years, and are said to be multiplying rapidly. The mating call of the male is heard as early as March 26th and is becoming one of the spring sounds of the woods, while reports of young broods come in from all over the western part of the country at least."

Although reports were current in 1916 telling of the rapid increase of these birds, this increase has not proven permanent. Mr. Tufts says:—

"Pheasants are rare indeed in Yarmouth County. I have seen but two in 10 years and have heard of very few having been seen. Last winter (1925-26) a covey of about twenty pheasants was reported as being seen daily during a period of exceptionally cold and snowy weather at Pembroke Shore, about seven miles from Yarmouth. They were fed by a fisherman of that place, but that is the only report of its kind that I have been able to get and a number of the active gunners of the region who hunt each fall with dogs, have not put up a pheasant in the past five years."

Mr. Harrison F. Lewis tells me that he saw a cock pheasant on his father's farm near Yarmouth in September, 1911. He had seen pheasants near the same place prior to that time. It was well known locally that there were pheasants in the vicinity at this time.

Mr. Tufts also tells me that—

"In the early nineties a few Golden Pheasants were liberated near Halifax by members of the 'Mic-Mac Club', but the attempt was a total failure.

"On September 7, 1924, Colonel A. G. Bremner of Clementsvalle, Annapolis County, Nova Scotia, liberated fifty young English Pheasants in that vicinity. In the spring of 1926 this stock was reported to be increasing."

PRINCE EDWARD ISLAND

Mr. R. W. Tufts informs me that—

"There were two attempts at introducing the Ring-necked Pheasant into Prince Edward Island in 1925. In the spring of that year four hens and one cock were liberated at Charlottetown while at Vernon River, about fourteen miles from Charlottetown, 'a few pairs' were liberated at the same time and during the summer of 1925 three covies were reported near Vernon River. While there has not been any appreciable increase noted to date (1927) they are still present in small numbers and are frequently reported as seen in the rural districts. It is claimed that the cock pheasant will attack and even kill the domestic cock and at least one authentic instance of this is reported by Mr. J. D. Jenkins of Charlottetown, where a large Plymouth Rock Cock was attacked and killed by a cock Ring-necked Pheasant."

CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF NORTH-EASTERN LABRADOR

By BERNARD HANTZSCH

"Beitrag zur Kenntnis der Vogelwelt des nordöstlichsten Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechshundfünfzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July, 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II. Besonderer Teil (Detailed Part), pages 307-392. (Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.)

Larus kumlieni Brewst. (p. 325). *Kumlien's Möve*.—KUMLIEN'S GULL.

This gull, described by Brewster in 1883²², is said to have much similarity with the Pacific species, *Larus glaucescens* Naum. [Glaucous-winged Gull]. Kumlien himself claimed that the birds assembled in Cumberland Sound in 1878 were this species. They were quite abundant there and were breeding on high cliffs (1879-p. 98). It is without question that the species, in case it exists at all as such, comes near this district of northeastern Labrador at least on migration, for which reason I mention it. Unfortunately, the autumn of 1906 brought a very weak migration of gulls, while at the end of September, 1905, the Killinek region is said to have swarmed with gulls and hundreds were killed without any trouble. No bird came into my hands which I could have designated as *L. kumlieni*.

Larus leucopterus Faber. (p. 325). *Polar Möve*.—ICELAND GULL.

Eskimo: *Nauja* (partim), *Naujarsuk*, -suk, -sui (-arsuk=small, thus little *Nauja*; partim).

The Iceland Gull may touch our district as a not rare visitor and migrant, but scarcely breeds there (p. 326), and also is much less frequent than its larger relative, *Larus glaucus*. I repeatedly observed single individuals or small bands of young birds in the ice of Hudson Strait and later in Ungava Bay. In numerous cases I did not venture a certain identification of the species. The birds are best recognized when they are seen near *Larus glaucus*. Then they show up because of their narrower wings, smaller form, more slender body, and greater activity. Their voice is clearer and more brief. The white

colouring of the third plumage is often so pure that one thinks of *Gavia alba* [Ivory Gull], if he does not observe the more conspicuous size and the light-coloured feet. Several times I had the charming spectacle before me on summer mornings, of several of the birds soaring in circles high in the clear air and turning about among each other in an easy, floating flight.

(Iceland Gull, p. 326). *Larus glaucus* behaves in a much more clumsy manner when in flight. In spite of the trouble which we took, we were not fortunate in killing one of the birds. The creatures flew very high for the most part and did not approach within shooting distance of our boat. On October 4th I received a young specimen in hand, but it was so much stained with blood that I refrained from acquiring it. A Eskimo whom I met on the way, had killed it along with three *Larus glaucus*.

Larus marinus L. (p. 326). *Mantel-Möve*.—GREAT BLACK-BACKED GULL.

Eskimo: *Kollêlik*, -ggik, ggît (*kollêk*=back, -*lik*=furnished with something, hence: He who has something on his back, on account of the slate-black mantle).

Apparently only a rather rare visitor in our district, not becoming more frequent until farther south on the Labrador coast, where it breeds. Whether the eggs brought back by the Canadian Neptune expedition from the region of Killinek really belonged to this species, and not rather to *Larus glaucus*, I should not like to offer an opinion. A decision on the basis of eggs is not possible at all in this case. During my entire stay in the northeast of Ungava Bay no certain specimen of the Great Black-backed Gull came before my eyes. Not until October 11th did I come upon three juvenile birds of this species in Gray Strait not far from Cape Chidley. Kumlien did not hear anything of the breeding of this species in the district of Cumberland Sound, although in the autumn of 1877 he observed some specimens in that place (1879, p. 99). Many Eskimos at Killinek, however, distinguish the juvenile birds quite well from *Larus glaucus* of approximately the same large size.

Larus argentatus smithsonianus Coues²³
Amerikanische Silbermöve.—AMERICAN HERRING GULL.

²²*Bull. Nutt. Ornith. Club*, p. 216: Primaries are marked with sharply defined spaces of ashy grey. The first primary is tipped with white and marked with ashy gray on the outer web and shaft of the inner web; the second primary is ashy gray on only part of the outer web; the third and fourth primaries have smaller white tips and are marked with ashy gray near their ends on both webs. Wing: 15.50-17.00 inches; Bill: 1.65-1.85; depth of bill at projection on the lower mandible: 0.60-0.66; Tarsus: 2.10-2.35.

²³*Larus argentatus* Pontoppidan, Herring Gull; the American subspecies *smithsonianus* is no longer recognized by the A.O.U.—R.M.A.

Eskimo: *Nauja*, -*ják*, -*jat* (*partim*), *Naujársuk*, -*súk*, -*suit* (*partim*); -*arsuk*=small.

Common visitor and not rare breeding bird on the coast and inland lakes. However, in the region it breeds only isolated or in small colonies. It likes to come into the inner part of deep bays, but outside of the breeding season it is seen much more rarely on the freshwater lakes.

This species also varies to an extraordinary degree, particularly in respect to its size. The measurements of three specimens collected near Killinek, in the middle of September, 1906, 2 males, 1 female, the smallest measurements belonging to the latter, are as follows: Wing: 390 (in moult) to 443 mm. Tail: 185-200. Length of bill: 53-60. Depth of bill: 17-20.5. Tarsi: 54-60. Middle toe including the 9-10, mm. long claw: 61-69 mm.

During the summer this species is perhaps the most abundant gull in the north of Ungava Bay. Almost always one sees single individuals or small, loose bands of younger birds especially, flying over the sea. Yet they seldom come near a boat on the coast. At times they fly about, half playing, half quarrelling, and mutually pursue one another with a varied, rather loud and deep *Kau*, *Kjau*. Their flight is essentially more clumsy and slower than that of the light-winged *Larus leucopterus* [Iceland Gull] or still more than that of the elegant *Rissa* [Kittiwake]. They are mostly quick forms, flying about in a lonely way, which perhaps contributes to the decoration, but little to the enlivenment of the world-detached landscape. Whenever in storm and fog they assemble in numbers in the inner part of bays, they are most frequently killed by the Eskimos and are consumed with relish.

NOTE 1: The European *Larus argentatus argentatus* Brünn. appears to visit the Atlantic coast of North America only as a rare guest. I never got a look at a Labrador specimen anywhere.

NOTE 2: On Opingevik, the most northeastern tip of the mainland of Labrador, in a strong wind on the 8th of September, I observed two gulls in adult plumage, which I took for *Larus delawarensis* Ord [Ring-billed Gull]. They repeatedly came quite near, and I delayed shooting because the wind blew away from the land. Suddenly the creatures vanished again. The species breeds farther southward in Labrador.

Xema sabinii (Sab.) (p. 327). *Schwalben-Möve*.—SABINE'S GULL.

A few individuals appear as rare autumn migrants. My companion Paksau seemed to have killed the species. Missionary Perrett, farther in the south, secured two specimens of the birds, which were shot in Davis Inlet in the fall of 1899. (p. 328.) Probably, however, the little birds were often overlooked or confused with terns. Turner secured a single male in the middle of July, 1884, near George River, Ungava Bay (1886, p. 252), and R. Ball gives the infor-

mation that another specimen was shot at Killinek in September, 1884. Bangs has a skin of the year 1894 from Okak (Townsend and Allen, 1907, p. 317). From neighbouring Baffin Island (Cumberland Sound) there is a skin of June 15, 1884, in the British Museum, London (*Cat. Birds Brit. Mus.*, xxv, 1896, p. 165), and Kumlien saw two Sabine's Gulls which settled down on the schooner October 6, 1877, during the passage from Kikkerten Island northwards (1879, p. 101).

Sterna hirundo L. (p. 328). *Fluss-Seeschwalbe*.—COMMON TERN.

Eskimo: *Immerkotailak*, -*laek*, -*lat* (*partim*). Kleinschmidt gives as explanation for the Greenland *Immerkutailak*=*lyskelos* [Danish], that is, without groin. (See Winge, *Groenlands Fugle*, 1898, p. 204); also in the Labrador dialect *immerkutak* signifies groin, -*ilak*=which is without. The small lower body with the weak feet which almost disappear in the feathers justifies the name: "Which is without groin".

With the uncertainty of the references and the lack of proper material in skins, I can not decide how far the notes on the occurrence of this species in Labrador really apply to this species of the following, *S. macrura* Naum. Macoun conjectures that *S. hirundo* L. (Common Tern) is the species which breeds on all islands and coasts of Labrador (I, p. 50). I doubt this very much. Yet F. Chapman, for example, in his book on *The Birds of North Eastern North America* says concerning this bird that among other places, it breeds in Greenland (1906, p. 82). The careful H. Winge definitely rejects this (*l. c.*, p. 314). That the species breeds on the larger freshwater lakes and streams of southern Labrador and from there reaches the coast, is possible, if one takes the lands of Hudson Bay into comparison. However, in our more narrow district, I consider *S. hirundo* L. at the most an occasional visitor or migrant.

Sterna macrura macrura Naum.²⁴ (p. 328).

Eskimo: *Immerkotailak*, -*laek*, -*lat* (*partim*).

It is most probably this tern which comes only as a migrant of undependable occurrence in north-eastern Labrador. Eifrig collected specimens at Cape Chidley in June, 1903 (1905, p. 236), and Turner calls (p. 329) them a plentiful, breeding bird on the islands in southern Ungava Bay (1886, p. 252). Terns came into my view only a few times, and only in two instances could I clearly recognize the bill as red to the tip.

²⁴*Sterna paradisæa* Brünnich according to the A.O.U. Check-List, 1910.—R.M.A.

It was so in the case of two birds in the evening of July 25th near the Button Islands and once more on August 16th in the case of a single specimen in Ungava Bay. But the Killinek Eskimos said that this bird occasionally appeared in great numbers at the beginning of autumn. They said the nearest breeding places of the birds lay in the southeast of Ungava Bay near George River. Macoun calls special attention to the breeding of the species in Ungava Bay because of a communication of Downs (I, p. 52). Kumlien thinks that it was *S. macrura* Naum. which was breeding more or less commonly along the whole

Labrador coast and on the islands in the north of Hudson Strait. In Cumberland Sound district, on the contrary, he observes that the species was occasionally found in quantity, but seemed to breed in only a few places in that locality and not at all regularly. Their movement seemed to regulate itself according to the migrations of the capelin, *Mallotus villosus* (1879, p. 101). The little individuals of this fish, often occurring in immense numbers, seem to be very welcome to the birds as an easy prey. (p. 329).

(To be continued.)

NOTES AND OBSERVATIONS

PERSEVERING ROBINS.—During the last week of April, 1927, a pair of Robins built a nest in an eaves-trough on the second storey of a house in Toronto. The trough on the side of this house is continued across the gable to the pipe which leads to the ground, and, as the nest was placed in this gable trough, it was directly in the path of all water from one side of the roof. The position of the nest made it inaccessible without the aid of special apparatus, so the following observations were made from a window on the other side of the street.

During the incubation of the first set of eggs the weather was about average, and all went well until the young ones were hatched, about May 15. Then we had three or four days of almost continuous rain and the nest was deserted about May 18. The nest appeared to be intact, but it must have been saturated with water, and no doubt this condition proved too much for the newly hatched young.

On May 24 Robins began repairing this nest. I could not ascertain whether the previous nestlings were removed or not, but doubtless they were, either by the Robins themselves or by some other agency. Almost as much material seemed to be used for repairs as would have gone into a new nest. While this work was going on it rained a great deal, and I noticed that the birds, on bringing material, would dip it in the trough beside the nest as though moistening it. Laying was commenced about May 27 and the young hatched June 11 or 12. Despite the persistence of rainy weather, this brood, which seemed to contain four, had no evident trouble, and left the nest in good health on June 24. Their success was due, quite probably, to the fact of one nest being placed on top of another, this allowing the water to work through the bottom without seriously affecting the upper storey.

From June 25 to July 11, I was out of the city but when I returned a Robin was again sitting on this nest. This time there had been little or no repair work and the nest had sunk almost to the level of the rim of the trough. During July there was an abnormal amount of rain. Nevertheless the Robin continued her incubation until July 23, no doubt past the day when the young should have appeared, and then deserted. During this last sitting, on very rainy days, the bird was often seen perched on the rim of the trough with head on one side as though watching the rising water. Perhaps, at such times, she was trying to reason out the situation.

There is an argument here on the negative side of the question, "Do animals think?" The instinct which enables a bird to select a nesting site told the Robins that this was a good spot, protected on the top, bottom and two sides; but reason failed to tell them that the eaves-trough which seemed made for the support of their nest was the indirect cause of its destruction.—R. J. RUTTER.

CLIFF SWALLOW NESTS AND RAIN.—The article on Persevering Robins recalls to mind some pertinent observations made during two separate descents of the Red Deer River in Alberta a few years ago.

This river bed is sunk from two to three hundred feet below the main prairie level and in many cases the valley walls approach the river bank in irregular, and more or less sheer, cliffs. Many wall spaces thus formed are sites of large colonies of nesting Cliff Swallows that plaster their gourd-like nests closely together making continuous mud-incrustations over considerable surfaces. The boundaries of these aggregations of nests are often very definite but to casual obser-

vation often erratically arbitrary in outline and extent. Many groups of nests are obviously under sheltering overhangs but others seem well out in the open and subject to the inclemencies of every weather. Often there is no apparent reason why nests should be huddled closely together as if space were very precious and then cease at an imaginary line beyond which conditions seem equally, or even more, desirable.

When the rains come, however, darkening the exposed faces of the cliffs with their wetness, much of the mystery is explained. In practically every case it is then seen that the nest colonies occupy the only dry spots of the irregular, and generally wet, surfaces and that the soluble, fragile nest-structures often cease almost on the line of moisture. Most of these colonies seem to be occupied only for a single season or a short series of years and new sites are selected at frequent intervals; consequently there are everywhere old and deserted nest groups in various stages of delapidation whose obvious age bespeaks their permanency and the good judgment with which they were founded as regards prevailing weather, wind and rain. One mild shower and wetting would be sufficient to dissolve their clayey structure into its constituent gumbo to drop with unctuous splash to the talus below or to flow away in stalactites of sluggish mud.

It does not seem that this safety of situation is generally achieved by a system of trial and error for few ruins of recent and obvious errors are noted as would be were that the case. By some means Cliff Swallows after nesting under such conditions for countless generations have evolved methods of nest-site selection that nearly unerringly pick out amid the multitudinous wall exposures and tricky wind currents of the canyons the safe situations. There is no necessity here at least to defer nest making until a mud-making rain supplies structural material and coincidentally marks out the safety zones on the cliffs for the river supplies them constantly, irrespective of weather, a source of the choicest mud, and building can be undertaken at any time. Swallows also generally like to carry on their work in bright sun and a drying atmosphere that fixes the growing sub-structure before further accretions are added. It may be however that the site is decided upon during or immediately after a shower and perhaps the foundation is outlined before the drying cliffs lose their tell-tale moisture and is then left to be completed in better building weather. However it is, whether occult instinct or empirical methods guide the birds, there is here shown a

most interesting adaptation to environment.—
ORNITHOLOGICAL EDITOR.

OBSERVATIONS ON THE RUFOUS HUMMING-BIRD (*Selasphorus rufus*), 1927.—The male hummer was the first to arrive here (Crofton, B.C.), but he seemed to be in such terrible haste that I did not at first have much opportunity to observe him until some time later when his ladies had arrived. I say "ladies" because I saw at least four females to one male.

Each male had his own territory, and this particular one chose the topmost bare twig of an apple tree as his throne or watch-tower. Occasionally the neighbouring gentleman would intrude, but would be chased off immediately in a most vindictive manner, both birds seeming to use very harsh words!

When the fruit trees came into blossom, Mr. Hummer was in the orchard every day. One does not have to see him in order to know that he is there, as he has his own particular song or "drumming". It is uttered as he swoops past one or shoots swiftly overhead and might be written *ch-ch-ch-chut-churrr* or *tut-ut-ut-ut-turrrre*. Immediately after making this sound he darts straight upwards until reaching the desired height when he comes to a sudden and complete full stop, remaining stationary in the air like a glittering ruby set in the blue sky. Whilst in this position he will repeat the ordinary call note of *tchik* which is common to both the sexes, then dropping suddenly he flies back to his "watch-tower". I think that the drumming sound is probably produced by the tail feathers. The male hummer has the monopoly of another and quite different sound also. This sound is produced continually as long as the bird is on the wing, and only varies by increasing in volume each time the bird moves from its position in the air. The sound is difficult to describe, but might be likened to tiny beads vibrating regularly in a thin metal box. Although, as far as my own observations go, the male rufous never flies without making this vibrating sound, the female never at any time produces it.

Mrs. Rufous is the architect and builder of the home; she gathers lichens from the trunks and branches of trees after the same manner that she gathers honey from the flowers, and having built a frame work of this material, which appears to be fastened together with spider's web, she lines it well with down from willow or other plants, the result being a deep though very tiny, perfect cup-shaped nest—an artistic ornament, one of

the marvels of Nature, yet inconspicuous on account of its small size and harmonising exterior.

This year the first nesting humming-bird I discovered started incubating on May 8th, and the last nestful of young flew on July 12.

One nest was built close to a window so that I was able to watch it at my leisure. The nest being completed the bird laid on May 20th. The first young one hatched on June 1st, and the second one on June 3rd. I watched the mother feed her little chicks: she would appear suddenly at the side of the nest, being greeted at once by two hungry mouths; showing no hurry, however, she would look around her in a leisurely fashion, and then, as though mysteriously reminded of her business would plunge her bill far down the first nestling's throat, apparently feeding it by regurgitation, treating the second one in the same manner and sometimes giving one or both a second helping. Without waiting for them to close their mouths, she would cuddle down in the nest and tuck them up in her wings. When they began to get feathered she ceased to brood them, only visiting the nest in order to feed them.

As the young hummers grew bigger they gradually tramped the nest out of shape, so that when they flew away on June 23rd it was no longer a dainty little cup, but an almost shapeless platform in comparison. There were no flying lessons; the little hummers buzzed fearlessly out into the world as though they had been accustomed to flying every day of their lives. They were not so expert with their feet, however, making several ineffectual attempts before securing a safe landing. I never found any young return to the nest having once left it, but they will return regularly to a chosen perch day after day, even when disturbed several times during the day, generally returning to precisely the same spot on the same twig each time.

The male humming bird appeared in April and was seen every day and at all times of the day until May 23rd, when he vanished. However, on May 29th, when rambling about a quarter of a mile away, I heard his characteristic "vibrating" and soon spotted him. I imagined that I heard two, but as I saw only the one, I may have been mistaken. On my visiting the same spot a few days later I found him still there, but he—if it was the same bird—did not return to the orchard

until June 14th when the acacia or locust trees were in full bloom—what honey-loving creature could resist that sweet abundance? I saw him regularly every day after that until June 23rd. when he vanished once more, this time for good. After that date I did not see many females either; in fact, I am inclined to think that most of the hummers seen after the end of June were young ones. One of them was rufous on the lower back and made the "vibrating" sound while in flight so I supposed that he was a young male putting on his first dress suit. He was a friendly little chap: while I was sitting on the veranda, watching him dine from the honey-suckle, he alighted on my shoulder, snuggled down comfortably and preened his feathers.

July 21st was the last day this year on which I noticed a humming-bird.

There is one peculiarity I noticed, and which belongs this time to the female. If any bird gets disturbed or alarmed and sends out an S.O.S. Mrs. Hummer is one of the first investigators to arrive on the scene, and will approach the disturber boldly uttering indignant *ichiks*. However, if a second Mrs. Hummer arrives to make investigations, they both forget all about the other bird's troubles, as, like streaks of lightning, they chase each other right out of the picture.—G. HAMMERSLEY.

RUFIOUS HUMMINGBIRD.—It may be of interest to some of our readers to know that a Rufous Hummingbird (female) appeared several times in my garden at Sylvan Lake, Alberta, in August. This is the first I have seen here, although I have always been on the lookout for it. The Ruby-throated is in and out of the garden during the season at all hours, and I was sorry to see the newcomer come off victorious in their many encounters. The Rufous appears slightly larger, and the spotted throat and rufous colours on sides and tail are very characteristic.—E. CASSELS.

A CORRECTION.—In the April number a typographical error makes the note concerning the Russian Geological Survey (p. 107) give 96 as the number of permanent employees of that organization. This number should have been 964.

OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

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In the following returns upon banded birds it will be noted that some returns may be thought to indicate, from the date of capture, violations of the Migratory Bird Act of Canada or the United States. The great majority of returns which seem to indicate violations, are from birds accidentally caught in traps for fur-bearing mammals, from birds caught in fish nets, killed by oil, or from birds found dead from unknown causes. Appropriate action has been taken in connection with the few returns which indicate illegal shooting.

INSTALMENT No. 24**RETURNS UPON BIRDS BANDED IN 1925.**

MALLARD, No. 232,131, ♀, banded by Reuben Lloyd, at Davidson, Saskatchewan, on August 9, 1925 (?), was killed at Bonus, Texas, on December 4, 1927. There is a doubt about the date of banding this bird. It may have been banded as young on July 17, 1923.

MALLARD, No. 232,365, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 31, 1925, was shot at a place about forty-five miles from Anamoose, near Velva, North Dakota, on October 23, 1927.

MALLARD, No. 322,954, yg. ♂, white, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 5, 1925, did not migrate in the fall, was wintered and liberated in the spring of 1926, and shot and badly wounded in the leg at a place near Ft. Benton, Montana, shortly before December 1, 1927. It appeared to be recovering a week after it was wounded, and if it lived, it was to be released still banded.

BLACK DUCK, No. 389,155, ♀, banded by H. S. Osler, at Lake Scugog, Ontario, on October 31, 1925, was killed on the Wateree River, about three miles above the point where the Wateree and Congaree Rivers join, forming the Santee River, South Carolina, several days before December 1, 1927.

BRONZED GRACKLE, No. 281,191, banded by Claude E. Johnson, at Ottawa, Ontario, on August 8, 1925, was killed in the vicinity of Windsor, North Carolina, on January 13, 1928.

RETURNS UPON BIRDS BANDED IN 1926.

COMMON MURRE, No. 389,216, ad., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on July 17, 1926, was shot at Battle Harbor, Labrador, Newfoundland, on October 3, 1926.

COMMON MURRE, No. 389,240, ad., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on July 17, 1926, was shot at a place near the Half-Moon Rocks, Cape Negro, Nova Scotia, on November 24, 1926.

COMMON MURRE, No. 301,441, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on August 4, 1926, was killed by a resident of Mosquito, near McCallum, Newfoundland, on May 27, 1927.

COMMON MURRE, No. 301,442, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on August 4, 1926, was shot at Coomb's Cove, a few miles from Harbour Breton, Newfoundland, in January, 1927.

COMMON MURRE, No. 301,446, ad., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on August 4, 1926, was shot at Twillingate, Newfoundland, during the week of December 6, 1926.

COMMON MURRE, No. 201,417, ad., banded by Harrison F. Lewis, on "Black Duck Island," near Etamamu River, Saguenay County, Quebec, on August 9, 1926, was found dead on the shore near Natashquan, Saguenay County, Quebec, on August 28, 1927. Apparently the bird had died but a short time before it was found.

COMMON MURRE, No. 201,439, juv., banded by Harrison F. Lewis, on Cormorant Rocks, Cape Whittle Sanctuary, Saguenay County, Quebec, on August 10, 1926, was shot on February 8, 1927—reported by a resident of Hermitage, Newfoundland.

COMMON MURRE, No. 201,442, juv., banded by Harrison F. Lewis, on Cormorant Rocks, Cape Whittle Sanctuary, Saguenay County, Quebec, on August 10, 1926, was shot off Lobster Cove Light, northwest coast of Newfoundland—reported on December 18, 1926.

COMMON MURRE, No. 201,449, juv., banded by Harrison F. Lewis, on Cormorant Rocks, Cape Whittle Sanctuary, Saguenay County, Quebec, on August 10, 1926, was killed just outside of Harrington Harbour, Saguenay County, Quebec, on November 20, 1926.

COMMON MURRE, No. 228,944, juv., banded by Harrison F. Lewis, on Flat Gull Island, Wolf Bay, Saguenay County, Quebec, on August 11, 1926, was shot at Harbour Breton, Newfoundland, on January 4, 1927.

COMMON MURRE, No. 228,946, ad., banded by Harrison F. Lewis, on Flat Gull Island, Wolf Bay, Saguenay County, Quebec, on August 11, 1926, was shot in Burn Bight, about one and one-half miles from Dodging Head, Newfoundland, 47° 0' 26" north latitude, and 55° 08' 43" west longitude, on November 29, 1926.

COMMON MURRE, No. 228,947, juv., banded by Harrison F. Lewis, on Flat Gull Island, Wolf Bay, Saguenay County, Quebec, on August 11, 1926, was killed at Mahone Bay, Lunenburg County, Nova Scotia, on December 14, 1926.

COMMON MURRE, No. 228,948, juv., banded by Harrison F. Lewis, on Flat Gull Island, Wolf Bay, Saguenay County, Quebec, on August 11, 1926, was shot in Hare Bay, Bonavista Bay, Newfoundland—reported on February 12, 1927.

COMMON MURRE, No. 299,609, ad., banded by Harrison F. Lewis, on Murre Island, Wolf Bay, Saguenay County, Quebec, on August 13,

1926, was shot at Western Arm, Notre Dame Bay, Newfoundland, on November 22, 1926.

RAZOR-BILLED AUK, No. 405,936, juv., banded by Harrison F. Lewis, on Middle Island, St. Mary Islands, Saguenay County, Quebec, on August 3, 1926, was killed on St. Margarets Bay, near Indian Harbour, Halifax County, Nova Scotia, on December 10, 1926.

RAZOR-BILLED AUK, No. 405,976, ad., banded by Harrison F. Lewis, on Middle Island, St. Mary Islands, Saguenay County, Quebec, on August 3, 1926, was killed just outside of Mutton Bay, Saguenay County, Quebec, on September 1, 1926.

RAZOR-BILLED AUK, No. 406,011, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on August 4, 1926, was shot at Point Aconi, Boularderie, on the Cape Breton coast, Nova Scotia, on November 23, 1926.

KITTIWAKE, "No. A. 269, Zoological Museum, Copenhagen, Denmark", yg., banded by A. Bertelsen, at Umanak, Western Greenland, on August 12, 1926, was shot at Seal Cove, White Bay, Newfoundland, on November 20, 1926.

GREAT BLACK-BACKED GULL, No. 389,253, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on July 17, 1926, was killed at Sandy Point, Bay St. George, Newfoundland—reported September 29, 1927.

GREAT BLACK-BACKED GULL, No. 389,254, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on July 17, 1926, was found dead in the same locality, on July 22, 1927. From the appearance of the body, the bird evidently died in 1926.

GREAT BLACK-BACKED GULL, No. 389,256, juv., banded by Harrison F. Lewis, at Aylmer Sound, Saguenay County, Quebec, on July 27, 1926, was killed in the northeast district of Newfoundland, during the fall of 1926—reported by a resident of Change Islands, Newfoundland.

GREAT BLACK-BACKED GULL, No. 418,416, juv., banded by Basil Colbran, at Lake George, Yarmouth County, Nova Scotia, on July 28, 1926, was found dead on the coast of the Bay of Fundy, Nova Scotia—reported on December 5, 1927. Apparently the bird had died a short time before it was found.

GREAT BLACK-BACKED GULL, No. 418,714, juv., banded by Harrison F. Lewis, on Middle Island, St. Mary Islands, Saguenay County, Quebec, on August 3, 1926, was recovered by a resident of Winter Houses, Port au Port, St. Georges District, Newfoundland—reported on May 13, 1927.

GREAT BLACK-BACKED GULL, No. 418,722, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on August 4, 1926, was shot on June 16, 1927—reported by a resident of Garnish, Newfoundland.

GREAT BLACK-BACKED GULL, No. 418,747, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County,

Quebec, on August 4, 1926, was killed at Night Island, in the vicinity of Campbellton, Notre Dame Bay, Newfoundland, on November 4, 1926.

GREAT BLACK-BACKED GULL, No. 418,847, juv., banded by Harrison F. Lewis, at Cape Whittle, Saguenay County, Quebec, on August 11, 1926, was found lying on the shore of Hog Island, on the northwest coast of Prince Edward Island, surrounded by the water of the Gulf of St. Lawrence and Malpeque Bay, on October 28, 1927. The bird had been shot.

GREAT BLACK-BACKED GULL, No. 418,881, juv., banded by Harrison F. Lewis, on Murre Island, Wolf Bay, Saguenay County, Quebec, on August 13, 1926, was shot at Port au Port, Newfoundland, about November 10, 1926.

HERRING GULL, No. 377,190, banded by Wm. I. Lyon, at Hat Island, Green Bay, Wisconsin, on July 8, 1926, was found dead on the north shore of Amherst Island, in the Bay of Quinte, directly opposite the village of Bath, Ontario—reported on September 20, 1927. The bird had apparently been sick, as it was seen for a number of days floating about the shore.

HERRING GULL, No. 421,118, banded by Clarke C. Miller, at Hat Island, Green Bay, Wisconsin, on July 8, 1926, was found dead with no signs of injury on the beach at Lake Erie, at Glen Erie, Long Beach, Ontario, about four miles from Mohawk Point, on September 19, 1926.

HERRING GULL, No. 336,253, banded by H. C. Wilson, at Sister Islands, Green Bay, Lake Michigan, on July 9, 1926, was recovered with a broken wing on the northeast shore of Lake Simcoe, eight miles from Orillia, Ontario, on October 1, 1926. Its band was removed.

HERRING GULL, No. 301,537, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on July 17, 1926, was found dead at the same place, on August 4, 1926. It was evident that the bird must have died soon after it was banded.

HERRING GULL, No. 301,546, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on July 17, 1926, was killed at Goole, Hermitage Bay, Newfoundland, on October 29, 1927.

HERRING GULL, No. 457,408, banded by Wm. I. Lyon, at Little St. Martins Island Shoal, Lake Huron, Michigan, on July 17, 1926, was shot at Contrecoeur, twenty-five miles northeast of Montreal, Quebec, on September 22, 1926.

HERRING GULL, No. 418,710, juv., banded by Harrison F. Lewis, on Middle Island, St. Mary Islands, Saguenay County, Quebec, on August 3, 1926, was killed by a resident of Raleigh, Straits of Belle Isle, Newfoundland, on August 24, 1927.

HERRING GULL, No. 376,918, imm., banded by C. L. Broley, at Shoal Lake, Manitoba, on August 29, 1926, was found dead at a place near Bergland, Ontario, about October 1, 1926. Apparently it had not been shot.

RING-BILLED GULL, No. 405,834, juv., banded by Harrison F. Lewis, at Fog Island Sanctuary, Saguenay County, Quebec, on July 15, 1926, was found dead floating in the northern end of Currituck Sound, North Carolina, about November 4, 1926.

RING-BILLED GULL, No. 405,843, juv., banded by Harrison F. Lewis, at Fog Island Sanctuary, Saguenay County, Quebec, on July 15, 1926, was found dead with a broken wing and leg on the sound beach off Miller Place, Long Island, New York, on October 28, 1926.

RING-BILLED GULL, No. 405,860, juv., banded by Harrison F. Lewis, at Fog Island Sanctuary, Saguenay County, Quebec, on July 15, 1926, was captured at Crystal River, Florida, on March 18, 1927.

RING-BILLED GULL, No. 405,884, juv., banded by Harrison F. Lewis, at Fog Island Sanctuary, Saguenay County, Quebec, on July 15, 1926, was found dead in South River, near Sayreville, New Jersey, between October 16 and 26, 1926.

FRANKLIN'S GULL, No. 444,096, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was shot at Peever, South Dakota, on September 30, 1926.

FRANKLIN'S GULL, No. 444,257, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was shot by a resident of Sisseton, South Dakota, on October 10, 1927.

FRANKLIN'S GULL, No. 444,656, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was found dead on a sandbar on Lower Miquelon Lake, Camrose district, Alberta, fifteen miles from the place where it was banded, on July 18, 1926.

FRANKLIN'S GULL, No. 444,719, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was killed by a hawk in a farmer's yard near Chaseley, North Dakota, on August 20, 1926.

FRANKLIN'S GULL, No. 444,957, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was found dead by the roadside at Wallace, South Dakota, on September 22, 1926. It is thought that the bird was killed by flying against a telephone wire.

FRANKLIN'S GULL, No. 444,967, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was caught, had its band removed, and was released unharmed at DeSmet, South Dakota, on May 19, 1927.

FRANKLIN'S GULL, No. 445,212, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was recovered and had its band removed on the Arkansas River, in the southwest part of Kansas, on October 14, 1927—reported by a resident of Offerle, Kansas.

FRANKLIN'S GULL, No. 445,377, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was killed on Big Stone Lake, in the extreme northeast corner of South Dakota, one mile from the Minnesota boundary and thirty miles from the North Dakota boundary, on October 10, 1926.

FRANKLIN'S GULL, No. 445,410, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was caught, as it could not fly very well, in the district of Cookville, thirty-six miles northeast of Edmonton, Alberta, along the Saskatchewan River, on July 20, 1926. It died two days later.

FRANKLIN'S GULL, No. 446,128, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was found with a crippled leg and wing at a place about five miles south of Tioga, North Dakota, on July 14, 1926. It died the next day.

FRANKLIN'S GULL, No. 446,228, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was recovered and had its band removed on the railway right-of-way, about two miles west of Webster, South Dakota, on September 16, 1927. From the appearance of its body, the bird had apparently been recently shot.

FRANKLIN'S GULL, No. 446,268, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was shot at Namaka, Alberta, on October 22, 1926.

FRANKLIN'S GULL, No. 446,528, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was shot at Namaka, Alberta, about thirty miles east of Calgary—reported on October 8, 1927.

FRANKLIN'S GULL, No. 446,666, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was found dead in a field at Vesta, Redwood County, Minnesota, on October 30, 1926.

FRANKLIN'S GULL, No. 446,830, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was found along the roadside seven miles south of Forman, North Dakota, on September 19, 1926.

FRANKLIN'S GULL, No. 447,302, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was shot in an alfalfa field at Leola, South Dakota, on June 2, 1927.

FRANKLIN'S GULL, No. 447,595, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was found dead in the same locality on July 28, 1926.

FRANKLIN'S GULL, No. 447,916, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was killed in a hail storm at Lake Herington, two miles west of Herington, Kansas—reported on June 6, 1927.

FRANKLIN'S GULL, No. 448,125, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was found dead with a shot through its wing at Hoskins Lake, three miles west of Ashley, North Dakota, on August 9, 1926.

FRANKLIN'S GULL, No. 448,143, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was killed at a place four miles west of Aberdeen, South Dakota, on September 16, 1926.

FRANKLIN'S GULL, No. 448,175, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was caught in the ice and found dead at Lac la Biche, Alberta, during the fall of 1926.

FRANKLIN'S GULL, No. 448,226, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was killed at a place six miles northwest of Oakley, Kansas, on October 7, 1926.

FRANKLIN'S GULL, No. 448,248, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was killed by a resident of Turkey, Texas, on October 15, 1926.

FRANKLIN'S GULL, No. 448,672, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on June 25, 1926, was "accidentally" killed at a place three and one-half miles south of Wahpeton, Richland County, North Dakota, on September 27, 1926.

FRANKLIN'S GULL, No. 448,864, yg., banded by Wm. Rowan, at Francis Point, Beaverhills Lake, Alberta, on July 10, 1926, was killed on Lake Imman, Kansas, eight miles south and three miles west of McPherson, on October 24, 1926.

FRANKLIN'S GULL, No. 448,903, yg., banded by Wm. Rowan, at Francis Point, Beaverhills Lake, Alberta, on July 10, 1926, was found in Heron Lake, Jackson County, Minnesota, on October 10, 1926.

FRANKLIN'S GULL, No. 449,247, yg., banded by Wm. Rowan, at Francis Point, Beaverhills Lake, Alberta, on July 10, 1926, was found at Alexandria, Minnesota—reported on October 10, 1927.

FRANKLIN'S GULL, No. 449,416, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on July 10, 1926, was found on Lake Shore, four miles southeast of Silverton, Brisco County, Texas, on October 5, 1926.

FRANKLIN'S GULL, No. 449,738, yg., banded by Wm. Rowan, at Francis Point, Beaverhills Lake, Alberta, on July 10, 1926, was killed and partly eaten by some animal in a small hay meadow about fifteen feet from a main highway, about three miles north of Mountain Lake, Cottonwood County, Minnesota, on November 15, 1926.

FRANKLIN'S GULL, No. 449,868, yg., banded by Wm. Rowan, at Beaverhills Lake, Alberta, on July 10, 1926, was caught in Stevens County, West Central Minnesota, thirty miles from the South Dakota state line, on September 25, 1926. It had its wing injured by flying against a telegraph wire, and died later from its injuries.

FRANKLIN'S GULL, No. 450,671, yg., banded by Wm. Rowan, at Francis Point, Beaverhills Lake, Alberta, on July 10, 1926, was found dead in the same locality, on July 27, 1926.

COMMON TERN, No. 372,406, ♀, banded by Walter E. Hastings, at Lone Tree Island, Huron County, Michigan, on July 17, 1926, was collected for scientific purposes for a Museum, at Long Point, Norfolk County, Ontario, on June 19, 1927.

COMMON TERN, No. 400,388, juv., banded by Edward S. Thomas, on Big Chicken Island, Lake Erie, Ontario, on July 24, 1926, was picked up dead and reported as a Gull on Clearwater Island, sometimes called Sand Key, Florida, on November 26, 1926.

COMMON CORMORANT, No. 301,402, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on July 3, 1926, was found dead in the sea at Cape Maria, on the north shore of the Bay Chaleur, Quebec, on September 14, 1926.

COMMON CORMORANT, No. 301,415, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on July 16, 1926, was recovered and had its band removed at a place one-half mile northeast of the High Sheriff Ledge, Swans Island, Maine, on January 15, 1927.

COMMON CORMORANT, No. 301,416, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on July 16, 1926, was killed while flying on the shore of Cape Chat, Gaspé County, Quebec, on October 23, 1926.

COMMON CORMORANT, No. 301,527, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on July 16, 1926, was killed at the St. Pierre and Miquelon Islands, south of Newfoundland, on March 17, 1927.

COMMON CORMORANT, No. 301,528, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on July 16, 1926, was recovered and had its band removed on Big Tusket Island, Yarmouth County, Nova Scotia, on January 12, 1927.

COMMON CORMORANT, No. 301,530, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on July 16, 1926, was shot at Bellechasse Island, Bellechasse County, Quebec, shortly before November 3, 1926.

DOUBLE-CRESTED CORMORANT, No. 5686, juv., banded by Harrison F. Lewis, on Egg Rock, Cape Whittle Sanctuary, Saguenay County, Quebec, on August 11, 1926, was found dead on Garden Island, Harrington Harbour, Saguenay County, Quebec, during the month of October, 1926.

DOUBLE-CRESTED CORMORANT, No. 228,802, juv., banded by Harrison F. Lewis, on Egg Rock, Cape Whittle Sanctuary, Saguenay County, Quebec, on August 11, 1926, was shot at Portage Island, Miramichi Bay, New Brunswick, on October 10, 1927.

DOUBLE-CRESTED CORMORANT, No. 228,928, juv., banded by Harrison F. Lewis, on Egg Rock, Cape Whittle Sanctuary, Saguenay County, Quebec, on August 11, 1926, was killed by a resident of Mt. Pleasant, South Carolina, during the month of November, 1926.

DOUBLE-CRESTED CORMORANT, No. 464,051, juv., banded by Harrison F. Lewis, on Fog Island Sanctuary, Saguenay County, Quebec, on August 16, 1926, was captured at Hampton Roads, one mile from Ocean View, Virginia, on October 12, 1926.

DOUBLE-CRESTED CORMORANT, No. 464,062, juv., banded by Harrison F. Lewis, on Fog Island Sanctuary, Saguenay County, Quebec, on August 16, 1926, was shot and died on the bank of the Halifax River, Florida—reported by a resident of Daytona, Florida, on December 20, 1926.

HOODED MERGANSER, No. 389,160, banded by H. S. Osler, at Lake Scugog, Ontario, on September 1, 1926, was shot off Stephenson's Point, Scugog Island, Ontario, on September 2, 1926.

MALLARD, No. 379,991, yg. ♂, banded by J. A. M. Patrick, near Yorkton, Saskatchewan, on July 24, 1926, was killed on a small pond on a farm at Richland, Kansas, on November 1, 1926.

MALLARD, No. 379,920, yg., banded by J. A. M. Patrick, near Yorkton, Saskatchewan, on July 26, 1926, was killed in Canadian County, Oklahoma, on November 10, 1927.

MALLARD, No. 388,539, ♀, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 22, 1926, was killed on the Snake River, about four miles above Grand View, Idaho, on December 16, 1926.

MALLARD, No. 388,540, ♀, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 22, 1926, was killed in the northeast part of Shasta County, near Glenburn, California—reported on November 23, 1927.

MALLARD, No. 388,541, juv., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 22, 1926, was recovered—reported by a resident of Nakamun, Alberta, on September 27, 1927.

MALLARD, No. 388,551, ♂, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 22, 1926, was killed on the Missouri and Northern Arkansas Railroad, near Enright, Arkansas, on December 22, 1926.

MALLARD, No. 388,554, ♀, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 23, 1926, was shot—reported by a resident of Scottsbluff, Nebraska, on December 2, 1927.

MALLARD, No. 388,563, ♀, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 25, 1926, was killed at New Gregory, Missouri, on November 20, 1927.

MALLARD, No. 388,565, ♂, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 25, 1926, was recovered and had its band removed in Hyde County, South Dakota—reported on November 24, 1926.

MALLARD, No. 388,573, ♀, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 26, 1926, was killed by a resident of Grand Chenier, Louisiana—reported on January 4, 1927.

MALLARD, No. 388,577, ♂, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 27, 1926, was killed on Moon Lake, Monroe County, Arkansas, on December 2, 1926.

MALLARD, No. 388,585, ♀, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 29, 1926, was caught in a trap, had its leg broken in three places, and was killed by a resident of Douglas, Wyoming—reported on March 23, 1927.

MALLARD, No. 322,986, juv. ♀, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was killed at a place between Iowa and Holmwood, Louisiana, on November 29, 1926.

MALLARD, No. 322,989, juv. ♀, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was shot by a resident of Kenaston, Saskatchewan—reported on September 24, 1927.

MALLARD, No. 322,992, ad. ♀, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was shot by a resident of

Morris, Minnesota,—reported on November 6, 1927.

MALLARD, No. 322,993, juv., with white ring around neck and two outer quill feathers white, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was killed at a place near Indian Bay, in Monroe County, Arkansas, on November 28, 1927.

SHOVELLER, No. 367,862, yg., banded by J. A. Briggs, at Victoria Plains, Saskatchewan, on July 7, 1926, was shot in Township 24, Range 11, West of the 2nd Meridian, near Tullymet, Saskatchewan, during the month of October, 1926.

SHOVELLER, No. 367,864, yg., banded by J. A. Briggs, at Victoria Plains, Saskatchewan, on July 7, 1926, was killed by a resident of Big Bend, Louisiana, on January 2, 1927.

SHOVELLER, No. 379,903, yg., banded by J. A. M. Patrick, at Yorkton, Saskatchewan, on July 26, 1926, was shot in Chester Municipality, Section 16, Township 15, Range 7, West of the 2nd Meridian, Saskatchewan, on September 18, 1926.

GREATER SNOW GOOSE, No. 202,135, ♂, banded by Hoyes Lloyd, per George Robertson, at the Experimental Farm, Ottawa, Ontario, on June 12, 1926, was kept in captivity, and died at the same place, on February 25, 1928.

CANADA GOOSE, No. 202,138, sent on May 6, 1926, from Kingsville, Ontario, to the Experimental Farm, Ottawa, Ontario, and banded by Hoyes Lloyd, per A. G. Taylor, on August 3, 1926, left the Farm by December 4, 1926, and was killed in Seven Islands Bay, Saguenay County, Quebec, on September 17, 1927.*

CANADA GOOSE, No. 202,144, sent on May 6, 1926, from Kingsville, Ontario, to the Experimental Farm, Ottawa, Ontario, and banded by Hoyes Lloyd, per A. G. Taylor, on August 3, 1926, left the Farm by December 4, 1926, and was killed at Poplar Branch, North Carolina, on January 10, 1927.†

HUTCHINS'S GOOSE, No. 303,550, ad., banded by O. J. Murie per Jesse W. Rust, at a place below Potato Creek, Old Crow River, Yukon Territory, on July 19, 1926, was captured at Old Crow Flats, near Timber Creek, Yukon Territory, on or about July 1, 1927.

HUTCHINS'S GOOSE, No. 303,147, yg., banded by O. J. Murie, at a place above Potato Creek, Old Crow River, Yukon Territory, on July 21, 1926, was taken at a place near Clairmont, Alberta, on October 14, 1926.

HUTCHINS'S GOOSE, No. 302,113, yg., banded by O. J. Murie, at Shafer Creek, Old Crow River, Yukon Territory, on August 9, 1926, was shot on a farm near the Minnidoka Dam, in Cassia County, Idaho, on November 17, 1926.

HUTCHINS'S GOOSE, No. 303,562, yg., banded by O. J. Murie, at Black Fox Creek, Old Crow River, Yukon Territory, on August 9, 1926, was killed at Washoe Lake, Washoe County, Nevada, on December 11, 1926.

LAPWING, "X5046 Inform Witherby High Holborn London", yg., banded by a correspondent of Messrs. H. F. and G. Witherby, at Ullswater,

*C.F.N. XLII, 1928, p. 22.

†C.F.N. XLII, 1928, p. 24.

Cumberland, England, in May, 1926, was killed near Bonavista, Newfoundland, during the latter part of December, 1927.

MARSH HAWK, No. 1426, imm., banded by J. R. Morton, at Teulon, Manitoba, on July 25, 1926, was shot at a place four miles east of Lake View, Iowa, on October 24, 1926.

BURROWING OWL, No. 368,148, yg., banded by A. Burton Gresham, at West Kildonan, Manitoba, on July 31, 1926, was shot by a resident of Spalding, Nebraska, on September 24, 1927.

FLICKER, No. 399,739, flg., banded by George Lang, at Indian Head, Saskatchewan, on July 13, 1926, was caught with a broken wing, had its band removed, and was released at Illinois Bend, Texas, on January 15, 1927.

CHIMNEY SWIFT, No. 197,961, banded by I. H. Johnston, at Charleston, West Virginia, on September 18, 1926, was pursued by a number of sparrows, struck a telegraph wire and fell dead on the street—reported by a resident of Aurora, Ontario, on June 29, 1927.

CROW, No. 227,893, yg., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on June 30, 1926, was shot at Parkston, South Dakota, on March 26, 1927.

CROW, No. 376,925, imm., banded by A. Burton Gresham per Norman Criddle, at Treestbank, Manitoba, on July 13, 1926, was killed at Pond Creek, Oklahoma, on January 15, 1927.

CROW, No. 367,354, ad., banded by Willie LaBrie, at Kamouraska, Quebec, on August 27, 1926, was shot at a place nine miles north of Palmyra, Pennsylvania, on November 5, 1926.

BRONZED GRACKLE, No. 442,179, ad., banded by Claude E. Johnson, at Ottawa, Ontario, on September 12, 1926, was killed by a trolley wire on April 19, 1927—reported by a resident of Ottawa, Ontario.

SHUFELDT'S JUNCO, No. A72,189; ♂, banded by T. T. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 9, 1926, was re-caught several times at the same station until September 18, 1926, when it was killed in a trap by a weasel.

SONG SPARROW, No. A72,224, banded by T. T. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 19, 1926, was re-caught at the same station until September 22, 1926, when it was found dead in a trap.

LINCOLN'S SPARROW, No. A72,123, banded by T. T. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on August 21, 1926, was killed in a trap at the same station, on September 11, 1926.

HOUSE WREN, No. A67,175, ad. ♂, banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on July 28, 1926, was re-caught at a different nest with a new mate at the same station, on July 1, 1927, and was killed by a mouse trap at this station, on July 30, 1927.

OREGON CHICKADEE, No. A67,482, ad., banded by P. S. Walker, at Vancouver, British Columbia, on August 7, 1926, was found dead at the same station, on August 8, 1926.

ROBIN, No. 265,751, juv., banded by P. S. Walker, at Vancouver, British Columbia, on July 22, 1926, was killed by a dog at the same station, on the day on which it was banded.

INSTALMENT No. 25

RETURNS UPON BIRDS BANDED IN 1925.

MALLARD, No. 305,120, banded by John Broeker, at Portage des Sioux, Missouri, on March 2, 1925, was killed at a place near Burnaby Lake, British Columbia, on December 29, 1927.

MALLARD, No. 388,512, ♀, banded by Paul E. Page, at Lac Ste. Anne, Alberta, on September 24, 1925, was shot in the warm spring creeks along the Gallatin River, Montana, on December 18, 1927.

BLACK DUCK, No. 323,900, banded by H. S. Osler, at Lake Scugog, Ontario, on September 27, 1925, was shot from a blind off Island Point, Back River, Maryland, on December 30, 1927, and reported as a Mallard.

BLACK DUCK, No. 389,336, banded by H. S. Osler, at Lake Scugog, Ontario, on October 4, 1925, was shot at a place thirty miles north of Helena, Arkansas, on the Mississippi River, on December 28, 1927, and reported as a Mallard.

BLACK-CROWNED NIGHT HERON, No. 385,497, banded by George E. Allen, at Barnstable, Massachusetts, on June 18, 1925, was killed at Isle-Verte, Témiscouata County, Quebec, on August 10, 1927.

RETURNS UPON BIRDS BANDED IN 1926.

MALLARD, No. 322,983, juv. ♀, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was killed in Cameron Parish, near Sunset Lake, eight miles from the Gulf of Mexico, Louisiana, on November 23, 1927.

MALLARD, No. 322,995, juv. ♂, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was shot by a resident of Humphrey, Arkansas, on January 4, 1927.

MALLARD, No. 322,999, juv. ♀, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was shot on Lake Christine, at Melby, Minnesota, on November 2, 1927.

MALLARD, No. 323,000, juv. ♂, banded by Bert Lloyd, at Davidson, Saskatchewan, on September 23, 1926, was killed at a place near Wellsville, Kansas, on December 8, 1926.

MALLARD, No. 389,197, ♂, banded by H. S. Osler, at Lake Scugog, Ontario, on September 30, 1926, was shot on a farm on the southeast quarter of Section 10, Township 16, Range 6, East, Poplar Park, Manitoba, on October 8, 1927.

MALLARD, No. 322,957, juv. ♂, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 1, 1926, was killed at Bayou Des Arc, near White River, about six miles northwest of Des Arc, Arkansas, on January 29, 1927.

MALLARD, No. 456,153, ♂, banded by F. H. Rose, at Moiese, Montana, on October 17, 1926, was killed on Ben's Lake, Wattsford, eighty miles east of Edmonton, Alberta, on September 17, 1927.

MALLARD, No. 456,247, ad. ♂, banded by F. H. Rose, at Moiese, Montana, on October 20, 1926, was found dead on the Little Bow River, nine miles west and six miles south of Kirkcaldy, Alberta—reported on May 28, 1927.

MALLARD, No. 431,945, ♂, banded by D. H. Bendick, at Leduc, Alberta, on October 23, 1926, was killed in Robertson Lake, Robertson County, Calvert, Texas, on November 27, 1926.

MALLARD, No. 226,822, juv. ♀, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 24, 1926, was killed on November 20, 1926—reported by a resident of Crowley, Louisiana.

BLACK DUCK, No. 389,181, banded by H. S. Osler, at Lake Scugog, Ontario, on September 26, 1926, was shot on Nes-chau Creek, about thirty miles north of Albany River, on James Bay, Ontario, about the last week in May, 1927.

BLACK DUCK, No. 389,185, banded by H. S. Osler, at Lake Scugog, Ontario, on September 28, 1926, was killed at Wedgefield, Georgetown, South Carolina, on December 21, 1927.

BLACK DUCK, No. 389,191, banded by H. S. Osler, at Lake Scugog, Ontario, on September 29, 1926, was killed at a place near the Coast Guard Station, Jones Beach, Long Island, New York, about January 8, 1927.

BLACK DUCK, No. 389,199, banded by H. S. Osler, at Lake Scugog, Ontario, on October 1, 1926, was shot in Baker's Pond, in Orleans, Cape Cod, Massachusetts—reported on December 29, 1927.

BLACK DUCK, No. 457,503, banded by H. S. Osler, at Lake Scugog, Ontario, on October 2, 1926, was killed on a Lake Erie Marsh, in Ottawa County, near Port Clinton, Ohio, on November 19, 1926.

BLACK DUCK, No. 457,504, banded by H. S. Osler, at Lake Scugog, Ontario, on October 2, 1926, was found caught in a muskrat trap by a resident of Fulton, New York, on March 18, 1927.

BLACK DUCK, No. 457,510, banded by H. S. Osler, at Lake Scugog, Ontario, on October 2, 1926, was shot in Point Pelee Marsh, Ontario, on October 21, 1927, and reported as a male.

BLACK DUCK, No. 457,518, banded by H. S. Osler, at Lake Scugog, Ontario, on October 4, 1926, was shot on Long Point Bay, north shore of Lake Erie, near St. Williams, Ontario, on November 16, 1926.

BLACK DUCK, No. 457,527, banded by H. S. Osler, at Lake Scugog, Ontario, on October 5, 1926, was killed on Chislom Lake, eight miles northwest of Ripley, Tennessee, in Lauderdale County, on December 8, 1927.

BLACK DUCK, No. 457,542, banded by H. S. Osler, at Lake Scugog, Ontario, on October 6, 1926, was killed at the Old River Outing Club, Council, Arkansas, on November 10, 1926.

BLACK DUCK, No. 457,543, banded by H. S. Osler, at Lake Scugog, Ontario, on October 6, 1926, was shot by a resident of North Island, St. Clair Flats, Pearl Beach, Michigan, on November 13, 1926.

BLACK DUCK, No. 457,555, banded by H. S. Osler, at Lake Scugog, Ontario, on October 6, 1926, was shot on Grand River, two miles east of Brantford, Ontario, on November 20, 1926, and reported as a Mallard.

BLACK DUCK, No. 457,556, banded by H. S. Osler, at Lake Scugog, Ontario, on October 6, 1926, was killed at the northeast corner of the

Sabine Lake, which is about three miles south of the mouth of the Sabine River, Texas, on December 10, 1926.

BLACK DUCK, No. 457,561, ♀, banded by H. S. Osler, at Lake Scugog, Ontario, on October 6, 1926, was killed on Old River, Lee County, Arkansas, on December 2, 1926.

BLACK DUCK, No. 457,584, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was shot at a place near Bayport, Long Island, New York, on December 3, 1927, and reported as a Mallard.

BLACK DUCK, No. 457,591, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was shot at Erie Bay, Pennsylvania, on December 4, 1926.

BLACK DUCK, No. 457,592, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was shot at a place near Port Clinton, Ottawa County, Ohio, on November 22, 1926.

BLACK DUCK, No. 457,596, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was killed on North Merritts Island, in Brevard County, Florida, on December 28, 1926.

BLACK DUCK, No. 457,598, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was shot at Hobcaw Barony, Georgetown, South Carolina, on December 27, 1926.

BLACK DUCK, No. 457,602, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was shot on the shores of Lake Erie, east of Monroe, Michigan, on November 17, 1927.

BLACK DUCK, No. 457,603, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was purchased dead by a resident of Ellenton, South Carolina—reported on November 28, 1927.

BLACK DUCK, No. 457,613, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was shot on Long Point Bay, north shore of Lake Erie, near St. Williams, Ontario, on November 16, 1926.

BLACK DUCK, No. 457,631, banded by H. S. Osler, at Lake Scugog, Ontario, on October 8, 1926, was caught at Rigolets, Louisiana, on November 5, 1926.

BLACK DUCK, No. 457,652, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed at the head of Colbert Shoals Canal, Colbert County, Alabama, on January 12, 1927, and reported as female Mallard.

BLACK DUCK, No. 457,655, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was shot on Niagara River, New York-Ontario boundary, on December 29, 1926, and reported as a Mallard.

BLACK DUCK, No. 457,657, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed in Crane Creek Marsh, south shore of Lake Erie, about twenty miles east of Toledo, Ohio—reported on November 18, 1926, as a Mallard.

BLACK DUCK, No. 457,660, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was shot at a place near Salem, New Jersey, about December 1, 1926.

BLACK DUCK, No. 457,671, banded by H. S.

Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed in a rice field on the Waccamaw River, about five miles from its mouth, Georgetown County, South Carolina, on November 15, 1926.

BLACK DUCK, No. 457,676, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed on the South Mulberry Plantation, on the Cooper River, at Oakley, Berkeley County, South Carolina, on January 31, 1927.

BLACK DUCK, No. 457,678, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed at Isle of Wright, five miles north of Ocean City, Maryland, on January 15, 1927.

BLACK DUCK, No. 457,680, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed on December 6, 1926—reported by a resident of Georgetown, South Carolina.

BLACK DUCK, No. 457,692, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was shot in Lake Erie, at the mouth of the Huron River, Ohio, on November 4, 1926, and reported as a Mallard.

BLACK DUCK, No. 457,704, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed in a rice field in Wedgefield Plantation, Georgetown, South Carolina, on November 8, 1926.

BLACK DUCK, No. 457,707, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was shot at a place near Webster, Day County, South Dakota, on September 16, 1927.

BLACK DUCK, No. 457,727, banded by H. S. Osler, at Lake Scugog, Ontario, on October 10, 1926, was shot in Long Point Bay, Lake Erie, Ontario, on November 8, 1927.

BLACK DUCK, No. 457,729, banded by H. S. Osler, at Lake Scugog, Ontario, on October 10, 1926, was killed in the sea-side marshes of Northampton County, Virginia, on December 7, 1926.

BLACK DUCK, No. 457,740, banded by H. S. Osler, at Lake Scugog, Ontario, on October 10, 1926, was killed at Cynthiana, Kentucky, on November 15, 1926.

BLACK DUCK, No. 457,749, banded by H. S. Osler, at Lake Scugog, Ontario, on October 10, 1926, was shot on the south shore of Lake Erie, twenty-five miles east of Toledo, Ohio, on November 17, 1927.

BLACK DUCK, No. 457,762, banded by H. S. Osler, at Lake Scugog, Ontario, on October 11, 1926, was shot at the Bishops Head Club, on Bloodsworth's Island, Maryland, on January 21, 1927.

BLACK DUCK, No. 457,764, banded by H. S. Osler, at Lake Scugog, Ontario, on October 11, 1926, was shot on the Rockefeller Creek, seven miles north of Marion, Ohio, on December 4, 1926.

BLACK DUCK, No. 457,779, banded by H. S. Osler, at Lake Scugog, Ontario, on October 11, 1926, was killed in Ross County, Ohio, on the Scioto River, half way between Circleville and Chillicothe, Ohio—reported on November 26, 1926.

BLACK DUCK, No. 457,801, banded by H. S. Osler, at Lake Scugog, Ontario, on October 11, 1926, was killed at Rock Island, on the Gulf coast of Taylor County, Florida, on November 23, 1927, and reported as a male.

BLACK DUCK, No. 457,809, banded by H. S. Osler, at Lake Scugog, Ontario, on October 11, 1926, was shot in the Long Point Marshes, Lake Erie, Ontario, on November 15, 1926.

BLACK DUCK, No. 457,813, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1926, was killed in a small pond in a field at Camilla, Georgia, about February 1, 1927.

BLACK DUCK, No. 457,814, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1926, was captured on Nolin River, near Spurrier, Hardin County, Kentucky—reported on December 13, 1926.

BLACK DUCK, No. 457,817, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1926, was caught in a mink trap on the Neuse River, five miles southeast of Smithfield, North Carolina, on March 21, 1927, and reported as a Mallard.

BLACK DUCK, No. 457,833, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1926, was killed on a farm near the Ohio River, midway between Evansville, Indiana, and Louisville, Kentucky, on January 8, 1927.

BLACK DUCK, No. 457,836, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1926, was shot on Nes-chaw Creek, about thirty miles north of Albany River, on James Bay, Ontario, about the last week in May, 1927.

BLACK DUCK, No. 457,837, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1926, was killed in the southeast quarter of the northeast quarter of Section 2, Carroll Township, Ottawa County, Ohio, on November 18, 1926.

BLACK DUCK, No. 457,872, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was killed in the marshes near Violet, St. Bernard Parish, Louisiana, on December 11, 1926.

BLACK DUCK, No. 457,878, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was shot in the Hamilton Gun Club Inlet, in Hamilton Bay, Ontario, on November 10, 1926.

BLACK DUCK, No. 457,879, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was shot at Curve Lake, Ontario, an Indian village about twenty-five miles northwest of Peterboro, Ontario—reported on December 10, 1927.

BLACK DUCK, No. 457,881, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was killed at the place where the Muscle Shoals of the Tennessee River run into Wilson Lake, Alabama, on December 10, 1927.

BLACK DUCK, No. 457,882, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was recovered on the south shore of Lake Erie, Ottawa County, Ohio, on November 5, 1926. Its band was removed.

BLACK DUCK, No. 457,883, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was killed at a place three miles north of

Shreve, Franklin Township, Wayne County, Ohio, on November 12, 1926.

BLACK DUCK, No. 457,891, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was killed on Long Brow Plantation, on the Combahee River, about eight miles from Green Pond, South Carolina, on November 20, 1926.

BLACK DUCK, No. 457,899, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was killed at the Santee Club, Santee, South Carolina, on January 18, 1927.

BLACK DUCK, No. 457,900, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13, 1926, was recovered in a marsh at Sandusky, Ohio, on November 5, 1926. Its band was removed.

BLACK DUCK, No. 464,102, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1926, was shot in Corson's Sound, near Corson's Inlet, New Jersey, on January 28, 1927.

BLACK DUCK, No. 464,107, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1926, was shot on Long Point Island, Norfolk County, Ontario, on November 15, 1926.

BLACK DUCK, No. 464,108, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1926, was shot on Sandusky Bay, near Port Clinton, Ohio—reported on November 30, 1926.

BLACK DUCK, No. 464,117, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1926, was shot in the same locality, on November 4, 1926.

BLACK DUCK, No. 464,118, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1926, was killed in Point Pelee Marsh, Ontario, on November 5, 1926.

BLACK DUCK, No. 464,132, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot by a resident of Victoria Corners, Ontario—reported on December 15, 1927.

BLACK DUCK, No. 464,148, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot on Arundel Plantation, Georgetown, South Carolina, on January 28, 1927.

BLACK DUCK, No. 464,149, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot at the mouth of the Thames River, Dover Township, Kent County, Ontario, on December 11, 1926, and reported as a Mallard.

BLACK DUCK, No. 464,158, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was killed on Ochlocknee River, near Havana, Florida, on December 29, 1926.

BLACK DUCK, No. 464,160, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was killed at Grassy Bay, near Atlantic City, New Jersey, on December 30, 1926.

BLACK DUCK, No. 464,162, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot on the marsh of Back Bay, Pocahontas Fowling Club, located at Munden, Princess Anne County, Virginia—reported on November 22, 1926.

BLACK DUCK, No. 464,172, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was killed at a place one mile north of the

Pope's Island Station, Chincoteague, Virginia, on January 31, 1927.

BLACK DUCK, No. 464,177, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot by a resident of North Judson, Indiana, on November 17, 1926, and reported as a female.

BLACK DUCK, No. 464,191, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was killed on the Lexington Water Company Lakes, Kentucky, about January 5, 1927.

BLACK DUCK, No. 464,197, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot at Long Point, Ontario, about November 15, 1926.

BLACK DUCK, No. 464,203, banded by H. S. Osler, at Lake Scugog, Ontario, on October 16, 1926, was shot at Blackwood Pond, Santee Club, Santee Post Office, South Carolina, on January 11, 1927, and reported as a Mallard.

BLACK DUCK, No. 464,241, banded by H. S. Osler, at Lake Scugog, Ontario, on October 18, 1926, was killed in Cape Romain Creek, about four miles from the mouth of Santee River, South Carolina, on November 24, 1926.

BLACK DUCK, No. 464,243, banded by H. S. Osler, at Lake Scugog, Ontario, on October 18, 1926, was shot in Big Creek Marsh, Ontario, in the fall of 1926 before December 4th—reported by a resident of Port Rowan.

BLACK DUCK, No. 464,244, banded by H. S. Osler, at Lake Scugog, Ontario, on October 18, 1926, was shot at the Bay Bridge Sporting Club Marsh, near Sandusky, Ohio, on November 12, 1926.

PINTAIL, No. 464,119, banded by H. S. Osler at Lake Scugog, Ontario, on October 14, 1926, was shot by a resident of Bradenton, Florida, on December 20, 1926.

LESSER SCAUP DUCK, No. 457,909, banded by H. S. Osler, at Lake Scugog, Ontario, on October 12, 1926, was killed on Lake Des Almand, St. John Parish, Louisiana, on November 17, 1926, and reported as a female.

LESSER SCAUP DUCK, No. 457,919, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1926, was killed in Reeds Creek, a part of Dickenson's Bay, on the Choptank River, Maryland, on November 19, 1926.

LESSER SCAUP DUCK, No. 457,924, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was shot in the same locality, during the months of October or November, 1926.

LESSER SCAUP DUCK, No. 457,932, banded by H. S. Osler, at Lake Scugog, Ontario, on October 16, 1926, was captured on Diamond Creek, Virginia, on December 15, 1926.

LESSER SCAUP DUCK, No. 457,934, banded by H. S. Osler, at Lake Scugog, Ontario, on October 16, 1926, was killed in the same locality, on November 3, 1926.

LESSER SCAUP DUCK, No. 464,219, banded by H. S. Osler, at Lake Scugog, Ontario, on October 17, 1926, was shot at Duck, North Carolina, on November 8, 1927.

LESSER SCAUP DUCK, No. 464,220, banded by H. S. Osler, at Lake Scugog, Ontario, on

October 17, 1926, was killed on the Little Choptank River, Maryland, on January 15, 1927.

LESSER SCAUP DUCK, No. 464,222, banded by H. S. Osler, at Lake Scugog, Ontario, on October 17, 1926, was shot in the same locality, during the months of October or November, 1926.

LESSER SCAUP DUCK, No. 464,224, banded by H. S. Osler, at Lake Scugog, Ontario, on October 17, 1926, was shot in the same locality, during the months of October or November, 1926.

LESSER SCAUP DUCK, No. 457,949, banded by H. S. Osler, at Lake Scugog, Ontario, on October 19, 1926, was shot in the same locality, during the months of October or November, 1926.

LESSER SCAUP DUCK, No. 457,950, banded by H. S. Osler, at Lake Scugog, Ontario, on October 19, 1926, was recovered on North River, Virginia, on December 23, 1926—reported by a resident of Ware Neck Post Office, Gloucester County, Virginia. Its band was removed.

LESSER SCAUP DUCK, No. 457,957, banded by H. S. Osler, at Lake Scugog, Ontario, on October 19, 1926, flew against a tennis court wire at Durham, North Carolina, on July 6, 1927. It was caught, had its band removed, and flew away.

LESSER SCAUP DUCK, No. 457,987, banded by H. S. Osler, at Lake Scugog, Ontario, on October 20, 1926, was shot in the same locality, during the last week of October, 1926.

LESSER SCAUP DUCK, No. 457,993, banded by H. S. Osler, at Lake Scugog, Ontario, on October 21, 1926, was killed in Mashoes Creek, North Carolina, on December 22, 1926.

LESSER SCAUP DUCK, No. 457,999, banded by H. S. Osler, at Lake Scugog, Ontario, on October 21, 1926, was shot in the same locality, on October 26, 1926.

LESSER SCAUP DUCK, No. 464,312, banded by H. S. Osler, at Lake Scugog, Ontario, on October 23, 1926, was killed at a place near the mouth of the Trent River, about a mile above where it enters the Neuse River, North Carolina, on December 11, 1926, and reported as a Black Duck.

LESSER SCAUP DUCK, No. 464,313, banded by H. S. Osler, at Lake Scugog, Ontario, on October 23, 1926, was killed at a place near Mt. Vernon, Virginia, on December 17, 1926, and reported as a male.

LESSER SCAUP DUCK, No. 464,317, banded by H. S. Osler, at Lake Scugog, Ontario, on October 23, 1926, was shot in the same locality, on October 26, 1926.

LESSER SCAUP DUCK, No. 464,321, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was shot in the same locality, during the last week of October, 1926.

LESSER SCAUP DUCK, No. 464,323, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was killed on a lake about ten miles north of Bartlesville, Oklahoma, on November 6, 1927.

LESSER SCAUP DUCK, No. 464,326, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was shot in the same locality, during the months of October or November, 1926.

LESSER SCAUP DUCK, No. 464,328, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was shot in the same locality, during the months of October or November, 1926.

LESSER SCAUP DUCK, No. 464,336, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was killed in the Little Choptank River, Dorchester County, Maryland, on December 6, 1926.

LESSER SCAUP DUCK, No. 464,337, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was killed in the Kentucky River, Kentucky, on April 14, 1927, by a resident of Ravenna, Kentucky.

LESSER SCAUP DUCK, No. 464,340, banded by H. S. Osler, at Lake Scugog, Ontario, on October 24, 1926, was killed at South Bay, Lake Okeechobee, County of Palm Beach, Florida, on January 30, 1927.

LESSER SCAUP DUCK, No. 464,365, banded by H. S. Osler, at Lake Scugog, Ontario, on October 25, 1926, was shot in the same locality, during the fall in which it was banded.

LESSER SCAUP DUCK, No. 464,366, banded by H. S. Osler, at Lake Scugog, Ontario, on October 25, 1926, was shot in the same locality, during the last week of October, 1926.

LESSER SCAUP DUCK, No. 464,369, banded by H. S. Osler, at Lake Scugog, Ontario, on October 25, 1926, was killed at a place directly opposite and about two miles from Elson's Point, or Long Point, at the mouth of Broad Creek, where it empties into the Choptank River, in Talbot County, Maryland, on December 30, 1926.

LESSER SCAUP DUCK, No. 464,370, banded by H. S. Osler, at Lake Scugog, Ontario, on October 25, 1926, was shot on Lake Worth, Florida, on December 5, 1926.

RING-NECKED DUCK, No. 464,223, banded by H. S. Osler, at Lake Scugog, Ontario, on October 17, 1926, was shot in Potomac Creek, Virginia, on December 7, 1926.

RING-NECKED DUCK, No. 457,947, banded by H. S. Osler, at Lake Scugog, Ontario, on October 18, 1926, was shot in the same locality, during the last week of October, 1926.

RING-NECKED DUCK, No. 457,975, banded by H. S. Osler, at Lake Scugog, Ontario, on October 20, 1926, was shot in the same locality, during the months of October or November, 1926.

RING-NECKED DUCK, No. 457,977, banded by H. S. Osler, at Lake Scugog, Ontario, on October 20, 1926, was shot at a place seventy-five miles east of Warren, Minnesota, on September 18, 1927.

CANADA GOOSE, No. 202,140, sent on May 6, 1926, from Kingsville, Ontario, to the Experimental Farm, Ottawa, Ontario, and banded by

Hoyes Lloyd per A. G. Taylor, on August 3, 1926, left the Farm by December 4, 1926, and was shot at Mattamuskeet Lake, Hyde County, North Carolina, on November 22, 1927.

CHIMNEY SWIFT, No. 196,847, banded by H. L. Stoddard, at Cairo, Georgia, on October 8, 1926, flew into a house at a place near Lawrence-town, Annapolis County, Nova Scotia, on June 16, 1927. It died after being kept in captivity for a day.

CHIMNEY SWIFT, No. 196,929, banded by

H. L. Stoddard, at Cairo, Georgia, on October 8, 1926, was found dead in the Station House at Bronson, eight miles from Chipman, Queens County, New Brunswick—reported on September 3, 1927, as a Swallow.

SHUFELDT'S JUNCO, No. A72,158, ad. ♂, banded by T. T. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 1, 1926, was re-captured twice at the same station on April 10, 1927, and was killed by a Shrike at the same place, on April 11, 1927.



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No. 7

NOTES ON THE DISTRIBUTION OF SOME DECAPOD CRUSTACEA COLLECTED NEAR SIDNEY, B.C.

By GERTRUDE M. SMITH

WHILE working on the life history of some of the edible clams of the British Columbia coast, for the Biological Board of Canada, at Sidney, on the east coast of Saanich Peninsula, 17 miles from Victoria, B.C., I made a collection of some of the decapods which inhabit the various types of beaches in that vicinity.

The literature for the identification of the species was provided by the Pacific Coast Station, Nanaimo, through the Director, Dr. W. A. Clemens, and the decapod collection at the Station was made available for comparison.

My thanks are due to Dr. C. McLean Fraser, of the Department of Zoology, for helpful suggestions and for assistance in identification.

To some extent at least each beach had its characteristic decapods. In this paper some correlation between the nature of the beach and the species found there will be attempted.

The beaches may be divided into four groups as follows:

- 1.—Flat—of sand, mud or gravel—going down to eel grass,
- 2.—Gently sloping—fine shingly—going down to eel grass,
- 3.—Gently sloping—coarse shingly—going down usually to kelp,
- 4.—Steep—rocky—with kelp.

Of the first group the rocky beaches are All Bay, Patricia Bay and Sidney Spit west. The muddy beaches are Knapp Island (east bay), Goudge Island (west side) and Shoal Harbour, the last mentioned a mixture of mud and shell. The gravel beach is at the head of the bay on the northwest side of Coal Island. The beach about $\frac{1}{4}$ mile south of the Ferry Wharf is a mixture of sand, coarse gravel and large stones.

To the second group belongs the beach on the southwestern point of Portland Island, the bay on Saanich Peninsula just opposite Piers Island, the beach on the northwest side of Shell Island, Swartz Bay and the beach on the south shore of Saltspring Island near Fulford Harbour.

To the third group belongs the beach at Shore Acres, about $\frac{1}{4}$ mile north of Sidney.

The fourth group includes the west point of Bentinck Island, the northern point of Black Island (near Portland), the reef in Canoe Pass, Goudge Island (west side), south shore of Piers Island, the rocks near the south shore of Saltspring Island within a short distance of Fulford Harbour, the rocks in Swartz Bay and the rocks in Shoal Harbour.

Bentinck Island is located near William Head about 20 miles southwest of Victoria, B.C. The following beaches are listed from Victoria northward. The beach south of the Ferry Wharf is about $\frac{1}{4}$ mile south of Sidney, Sidney Spit is directly east of Sidney and all the other beaches are north of Sidney. The beaches on Saanich Peninsula, from south to north, are Shore Acres, All Bay, Shoal Harbour, Swartz Bay, Saanich Peninsula (opposite Piers Island), on east side and Patricia Bay on west side. The islands in adjacent waters, from south to north, are Sidney, Shell, Coal, Goudge, reef in Canoe Pass, Knapp, Piers, Black, Portland and Saltspring. All of these, with the exception of Bentinck, are within a ten-mile radius.

Some of the specimens were obtained by dredging south of the entrance to Shoal Harbour at a distance of 10-20 fathoms. The bottom, for the most part, was rocky.

Some of the beaches are not touched directly by strong currents. These are All Bay, Coal and Knapp Islands, Patricia Bay, Shoal Harbour, Shore Acres and south of Ferry Wharf. Most of these beaches, with the exception of the last two mentioned, are also protected from strong tides and heavy storms. In most cases they are situated in a bay bounded by rocks.

On the other hand, some of the beaches are exposed to swift currents. Among these are Bentinck Island, Canoe Pass Reef, Goudge, Piers, Portland and Black Islands, Saanich Peninsula, Saltspring and Shell Islands, Sidney Spit west and Swartz Bay. Some of these, as Piers, Portland and Sidney Islands, are also exposed to heavy storms.

Generally there was found to be a greater

variety of species on those beaches lying close to a strong current. This is probably due to the increased availability of food material. Greater variety is found also on rocky than on sand or gravel beaches. This is, very likely, because food is more readily obtained and because a certain amount of protection is afforded.

Some of the species of crabs are much more widely distributed than others. For example, *Hemigrapsus nudus* Dana and *Hemigrapsus oregonensis* Dana were present on almost every type of beach, ranging from fine sand, as at Patricia Bay, to the rocky type of beach, as at Shore Acres. On the sandy beach they live in holes burrowed in the sand, on the rocky, they make their homes beneath and among the rocks.

Other species were found to be more or less characteristic of the type of beach on which they were present. For example, some species were found mainly on the type of beach described in groups 1 and 2. These were *Cancer productus* Randall, the commonest; *Cancer gracilis*, Dana, found only at Shoal Harbour; and *Cancer magister*, Dana, found only at Sidney Spit. These crabs live principally among the eel grass. *Cancer productus* was noted usually where the bottom was of gravel or of rocks. The nature of the beach at Shoal Harbour, i.e., muddy, seems to be preferred by *Cancer gracilis*, for although it was found only at that location, Schmitt (1921) states that *C. gracilis* is usually found on a muddy bottom. *Cancer magister* was obtained on the sandy bottom which it is said by Schmitt to prefer. *C. magister* is provided with a "straining apparatus" which prevents sand from entering the gills.

Most of the other species were found on rocky beaches as described in groups 3 and 4. Of these some were more numerous than others. The commonest of them was a small crab, *Petrolisthes eriomerus* Stimpson, which was found beneath the rocks. *Cancer oregonensis* Dana was collected on Bentinck and Saltspring Islands. *Hapalogaster mertensii* Brandt was found on Bentinck and Goudge Islands. In both cases the crabs were living among and beneath the rocks. Less common was the species, *Lophanopeus bellus* (Stimpson), which was among the rocks off Saltspring Island.

On the kelp near rocky shores were commonly the two species of kelp crab, *Pugettia gracilis* Dana and *Pugettia producta* (Randall). The latter was formerly known as *Epiplatys productus*. There was also a large green crab, *Telmessus cheiragonus* (Telesius), on the inshore kelp on shingly beaches, as at Shore Acres, and also on the beach at Sidney Spit. This species was found in the early part of

the summer, i.e., in May of 1926 but was not noted later in the summer either in 1926 or 1927. Since many species found in the waters adjacent to the Strait of Georgia migrate into deeper water during the summer months, it is possible that this species also does so.

The position at which the different species occurred on the beaches varied considerably. *Hemigrapsus nudus* and *Hemigrapsus oregonensis* occurred anywhere from high to low tide line. *Cancer productus*, *Cancer magister*, *Cancer gracilis* and *Petrolisthes eriomerus* were found from $\frac{1}{4}$ to low tide and somewhat below. *Cancer oregonensis* and *Hapalogaster mertensii* were observed little above low tide line.

The commensal crab, *Fabia subquadrata* Dana, occurred occasionally in the butter clam, *Saxidomus gigantea*, and *Pinnixia littoralis* Holmes occurred generally in the horse clam, *Schizothærus nuttallii*. As the clams were present on practically all the clam beaches in the area under consideration, these crabs had a wide distribution.

Among those dredged on the rocky bottom from 10-20 fathoms were *Oregonia gracilis* Dana, *Hyas lyratus* Dana, *Chorilia longipes* Dana, *Scyra acutifrons* Dana. Of these, *Oregonia gracilis* was much the most numerous.

One species of sand shrimp, *Upogebia pugettensis* (Dana), was very commonly present on the beaches where the clams were dug. The species, *Callinassa californiensis* Dana, was found on only one of the beaches. That was situated on a point, Roberts Point, about $\frac{1}{2}$ mile north of Sidney. It consisted of a mixture of sand, shell and gravel and was directly exposed to heavy storms.

In the shallow water near shore the "coon-striped" shrimp, *Pandalus danæ* Stimpson, was sometimes very plentiful. With it occurred the green shrimp, *Spirontocaris paludicola* (Holmes).

In the material dredged off Shoal Harbour at a depth of 10-20 fathoms, the shrimps *Nectocrangon alaskensis* Kingsley and *Paracrangon echinata* Dana, were the most numerous. *Pandalus danæ* was present in fairly large numbers. Less numerous were *Nectocrangon lar* (Owen), *Spirontocaris townsendi* Rathbun, *Spirontocaris murchiei* Rathbun and *Munida quadrispina* Benedict. *Spirontocaris murchiei* and *Nectocrangon lar* were described from Alaskan waters and have not been recorded farther south. The shrimp identified as *Spirontocaris murchiei* agreed in every respect with the description given. The same is true of those identified as *Nectocrangon lar* except that the keels are not so high on the carinæ of the abdominal segments and there is a single spine

between the median spine and the lateral carina of the carapace.

COMPLETE LIST OF THE SPECIES INCLUDED IN
THE COLLECTION

BRACHYURA

Cancer gracilis
" *magister*
" *oregonensis*
" *productus*
Chorilia longipes
Fabia subquadrata
Hemigrapsus nudus
" *oregonensis*
Hyas lyratus
Lophanopeus bellus
Oregonia gracilis
Petrolisthes eriomerus
Pinnixa littoralis
Pugettia gracilis
" *producta*
Scyra acutifrons
Telmessus cheiragonus

ANOMURA

Hapalogaster mertensii

MACRURA

Callinassa californiensis
Munida quadrispina
Nectocrangon alaskensis
" *lar*
Pandalus danæ
Paracrangon echinata
Spirontocaris murdochi
" *paludicola*
" *townsendi*
Upogebia pugettensis

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CONCERNING SOME SHREWS OF THE MAINLAND OF SOUTHWESTERN BRITISH COLUMBIA

By MORRIS M. GREEN



STUDENT of those wee, secretive beasts, called shrews, is attracted to this region because its compact diversity of terrain creates conditions congenial to a number of species of shrews.

This region includes the alluvial meadows and bogs of the lower Fraser River, the tidewater marshes of the Pacific Ocean, coniferous forests of gigantic trees, shading a moist tangle of rich vegetation on the forest floor, and the Cascade Mountain range, where proper ecological conditions can exist for alpine shrews.

The climate is oceanic, not continental. Moisture-laden winds, blowing from the Pacific ocean in the winter time, cause much rain, with little snow or ice, near Vancouver, but, as these winds strike the cold summits of the Cascade range, a

great snowfall is produced. The moist and mild climate of the sea-coast produces alders fifteen inches in diameter, elderberry bushes fifteen feet high and skunk-cabbage leaves three feet long.

The Fraser delta seems to mark the northern limit of geographical distribution of several species of shrews of the Pacific Coast region. It is a small terrestrial heaven "where every prospect pleases and only man is vile."

As many shrews are no larger than a man's little finger, their pursuit will not attract those individuals who like to see themselves photographed, seated on a dead caribou or grizzly bear, which was shot from a safe distance, with a high-power rifle. Their minute size and retiring ways make them attractive to elderly men patient enough to endure the dogged drudgery

involved in trapping, preserving and studying them.

A shrew may enter a trap at any hour and may decay quickly when killed in a trap, owing to its animal diet. To place a large number of shrew traps, to visit them at least three times a day and to preserve the catch, before decay sets in, means an eighteen-hour day of work.

The following notes concern six species of shrews of the genus *Sorex* taken by me in the region under discussion. The measurements, in millimeters, give actual dimensions of total length, tail vertebrae and hind foot; the dental characteristics mentioned are easily observed in the cleaned skulls with a ten-power magnifying glass.

Sorex cinereus cinereus Kerr.—MASKED SHREW.

99-44-12.5. A half dozen of this species was taken at Alta Lake, on the Cascades, in the gravel bank of a small brook, where the dusky shrew was very much in evidence. Externally this shrew differs from the dusky shrew in its smaller body and hind foot and heavily pencilled tail. The tail of the dusky, as found at Alta Lake, was sometimes naked at tip. An absolute criterion for identification of *Sorex cinereus* lies in its skull, where the third upper unicuspid tooth is larger than or equal to the fourth. In *Sorex vagrans* and *Sorex obscurus setosus*, the third unicuspid is smaller than the fourth. This and the water shrew (*Neosorex*) are alpine species, at home in the Cascade range. An adult female, taken at Alta Lake, was the largest specimen of this species ever seen by me, measuring 111, 43, 13. A female, captured July 3, was nursing.

Sorex vagrans vagrans Baird.—WANDERING SHREW.

105-44-13. This animal's tail is both absolutely and relatively shorter than that of the preceding, which it resembles closely in colour. I trapped it both at Chilliwack and on Vedder Creek, 18 miles to the south, in open, grassy locations. It was not taken in the Cascade range, at Alta Lake. A male taken July 4, 1927, at Vedder Creek, had testes 6 mm. long; side-glands 12 by 5 mm.

Sorex obscurus setosus (Elliott).—DUSKY SHREW.

122-56-14.5. This species, as well as *Sorex vagrans* and *Sorex o. setosus*, in summer pelage, is

sepia brown in colour, just as *Sorex b. bendirii*, *Sorex p. navigator* and *Sorex t. trowbridgii* are plumbeous in tone. This is the largest of the trio, the dimension of its hind foot usually identifying it. Taken on Vedder Creek, 18 miles south of Chilliwack, in dense coniferous forest, with Trowbridge Shrew. Also taken at Squamish, in grassy margins of pools. At Alta Lake it was very abundant in the steep grassy bank of a small stream. Males taken here in early July had well marked side-glands. These glands, in an animal taken July 8, measured 11 x 3.5 mm. Testes 5 mm. long. Moults incomplete. A female, July 5, contained 6 embryos. The twilight hour and 9 in the morning seemed to be favoured periods for trapping these animals.

Sorex trowbridgii trowbridgii Baird.—TROWBRIDGE SHREW.

121-58.5-14. This is a medium-sized shrew, plumbeous in colour, with long, bi-coloured tail. It seems to prefer low altitudes and, like Bendire Shrew, terminates its range in the Fraser delta. Taken in dense coniferous forest, on Vedder Creek, 18 miles south of Chilliwack. Not found at Squamish, on coast, a few miles north of Vancouver.

Sorex palustris navigator Baird.—MOUNTAIN WATER SHREW.

158-83-22. This handsome shrew is dark plumbeous above, beautifully frosted with white-tipped hairs. Under surface of body and tail white, contrasting superbly with rest of body. One taken by me, on July 5, 1927, at Alta Lake on Pacific Great Eastern Railway, at 2200 feet altitude. This specimen was trapped on a half-submerged log, in middle of brook. This species, like *Sorex cinereus*, belongs to the boreal fauna of the Cascade range.

Sorex bendirii bendirii (Merriam).—BENDIRE MARSH SHREW.

152-74.5-20.5. This is a large shrew, mono-coloured in sooty plumbeous, and is one of the Pacific Coast shrews which do not appear to venture north of the Fraser delta. One taken among aquatic plants bordering a fresh-water slough at Chilliwack, in association with Townsend's vole.

A REPORT CONCERNING DESTRUCTION OF BIRD LIFE AT LIGHTHOUSES ON THE ATLANTIC COAST

By R. W. TUFTS

IT HAS LONG been known that birds have suffered considerable damage in their annual migrations by coming in contact with lighthouses. With a view to ascertaining the approximate extent of this destruction in Canada, questionnaires were sent out by the Commissioner of Dominion Parks to all lightkeepers on our Atlantic and Pacific seaboards. In British Columbia this work was carried out by Mr. J. A. Munro, Chief Federal Migratory Bird Officer for the Western Provinces, and in Ontario and Quebec by Mr. Harrison F. Lewis, Chief Federal Migratory Bird Officer for those provinces, while the work along the coasts of the Maritime Provinces and Newfoundland was allotted to the writer.

Mr. Munro's report appears in *The Canadian Field-Naturalist* for October and November, 1924. It is noted from his report that the questionnaire was forwarded to 45 lightkeepers, and in every case the form was returned duly completed. In this respect the writer was not so fortunate, for in spite of the fact that stamped and addressed envelopes were enclosed in each case, a large number remained unanswered. In this connection the following tables may be of interest:—

Total number of questionnaires sent	453
Nova Scotia.....	270
New Brunswick.....	120
Prince Edward Island.....	53
Newfoundland (Lights maintained by the Dominion of Canada)	10
	— 453
Total returns received.....	197
Nova Scotia.....	119
New Brunswick.....	55
Prince Edward Island.....	21
Newfoundland (Lights maintained by the Dominion of Canada)...	2
	— 197
(A) Number reporting NO damage to birds.....	152
(B) Number reporting birds found dead	45
	— 197
(A) classified	
Nova Scotia.....	96
New Brunswick.....	41
Prince Edward Island.....	15
Newfoundland (Lights maintained by the Dominion of Canada)...	2
	— 154

(B) classified	
Nova Scotia.....	23
New Brunswick.....	14
Prince Edward Island.....	6
Newfoundland (Lights maintained by the Dominion of Canada)...	2
	— 45

(A) and (B) are further classified as to (1) location of station and (2) character of light:

- (A) (1) Situated on the mainland, 121. On an island, 31.
- (2) Fixed light equipment, 131. Revolving or flashing, 21.
- (B) (1) Situated on the mainland, 27. On an island, 16. (Location of two not stated.)
- (2) Fixed light equipment, 21. Revolving or flashing, 22. (Character of two lights not stated.)

It seems fair to assume that a large percentage of the number of lightkeepers who failed to reply to the questionnaires had no casualties to report. This supposition is strengthened by the fact that a considerable number of low elevation, and low power lights located along rivers and estuaries, were included in that classification.

The difficulty in ascertaining the extent of the annual loss to bird life by lighthouses, is increased by the fact that the lightkeepers do not know the birds well and consequently meagre and often contradictory replies are received. It also seems highly probable that where lighthouses are adjacent to the ocean, many injured and dead birds fall into the water and are swept away, thus escaping notice. It will be observed that most of the fatalities occur on rainy or foggy nights, though to this there would appear to be one notable exception, i.e. Cape Anguille, Newfoundland, where in 1908 a thousand birds were reported on a "clear dark night".

Twenty-two stations reported "sea birds" and thirty-eight "land birds." The species recognized are listed below:

TIMES MENTIONED	
Petrels.....	8
Snipe or beach birds.....	1
Gulls.....	1
Black Duck.....	1
Other ducks (sp. ?).....	1
Brant.....	2

Goose.....	1
Heron.....	2
Bittern.....	1
"Sparrows".....	1
"Bluebird" (Junco).....	1
"White-tailed sparrow" (Junco ?).....	1
Junco.....	1
"Yellow birds" (Warblers ?).....	3
Song Sparrow.....	1
Robin.....	1
Swallow.....	1
Black-poll Warbler (immature).....	1
"Grey bird" (sparrow ?).....	1
Goldfinch.....	1

Land birds appear to be the chief sufferers from the lighthouse menace, both on the Atlantic and on the Pacific coasts. Of 2000 birds reported killed by the towers at Cape Anguille and Country Harbour, for instance, all were land birds, while most of the sea bird casualties were single individuals.

Few if any practicable suggestions were offered as to adequate means of overcoming this particular menace to bird life. A strong net surrounding the light and a few feet from it might prove effective in the case of the land birds and the smaller sea birds. The net should be of twine and not in any case of wire. Mr. Munro's suggestion that a tarpaulin or canvas be arranged about the railing of the deck or gallery, to prevent wounded or exhausted birds from being blown down, would seem to be an excellent idea.

There follows a list of such stations as had casualties to report, together with brief descriptive notes.

PANMURE ISLAND LIGHT (*Post Office, Panmure Island, P.E.I.*).—This station is situated on the southeast coast of Prince Edward Island, in Cardigan bay; has a fixed light, and an elevation of 96 feet. The officer in charge of this station reports that the mortality of bird life varies greatly annually, depending upon the number of foggy and stormy nights during the migration. The greatest losses appear to take place in September and early October. Number picked up varies from three or four to several hundreds, nearly all being small land birds of many different species. The birds are killed by striking the tower below the rays of light, about one-third of those which fall to the ground recover after a short time and fly away.

CAPE ANGUILE (*Post Office, via Cordroy, Newfoundland*).—This station is on the mainland at an elevation of 120 feet and has a revolving flash light. The attendant states that in the

year 1908 about one thousand small birds were killed on a clear dark night. Since that time probably not more than 200 in a year. They appear to flutter about the light until they become exhausted or kill themselves by striking the glass in full flight. The keeper has picked up birds with broken bills. In referring to the species he states that only "small land birds" have been found.

SHEET HARBOUR PASSAGE RANGE (*Post Office, Sheet Harbour Passage, Halifax County, N.S.*).—We have at this point two fixed lights, one above the other, situated on the mainland at an elevation of 51 and 75 feet, respectively. Only one bird reported as having been found during the keeper's experience and that was after a stormy night. Species not known.

BLACK ROCK POINT (*Post Office, Boulardarie, Victoria Co., C.B., N.S.*).—A fixed white light, situated one and a half miles northeast of entrance to Big Bras d'Or lake, about 50 feet above sea level, on the island of Boulardarie. Keeper reports that during his experience "very few" birds have been killed at this station.

SEAL ISLAND LIGHT (*Post Office, Barrington, Shelburne Co., N.S.*).—This station is equipped with a revolving light at an elevation of 90 feet above sea level, on an island approximately 20 miles from the mainland. Birds are reported as "occasionally killed here, particularly on foggy nights during July and September. Leach's Petrels and immature Black-poll Warblers." Both species are abundant breeders on Seal island. A very interesting note is recorded in answer to question 12 to the effect that a decrease of 99 per cent has been noted since the original fixed light was replaced by the present revolving one, some 15 years ago. Seal island is now a Dominion bird sanctuary, being the home of an immense colony of Herring Gulls in addition to several other interesting species.

PICTOU BAR (*Post Office, Pictou, N.S.*).—Situated on the mainland at an elevation of 48 feet, at the entrance of Pictou harbour, with a fixed light. Only one bird reported killed in the experience of the keeper. This was during the month of August and was on a clear night and it was reported as being a "land" bird.

PEGGY POINT (*Post Office, Peggy Cove, Halifax Co., N.S.*).—A fifteen-hundred candle-power revolving light, visible 8 miles, situated on the east side of the entrance to St. Margarets bay, on the mainland. The keeper states "nothing but Mother Carey's Chickens (Leach's Petrel), are killed there." They are destroyed on thick, foggy nights by coming in contact with the glass and are picked up in the morning with broken

necks. The keeper also states that the mortality appears to be decreasing during recent years.

ISAAC'S HARBOUR (*Post Office, Isaac's Harbour, Guysborough Co., N.S.*).—Situated on the mainland near the entrance of Country harbor, at an elevation of 82 feet, and has a revolving light. The attendant reports that very few birds are killed at the present time. Formerly a small number were destroyed on foggy nights but of recent years practically none have been killed.

CHESTER IRON BOUND (*Post Office, Blandford, Lunenburg County, N.S.*).—Situated approximately seven miles from the nearest point of mainland off Mahone bay, has a diamond white revolving light, elevation not stated. Keeper in charge states casualties most serious during April and May, October and November occurring chiefly on foggy and stormy nights. Mentions "petrels and all kinds of small land birds up to the size of sparrows." Frequently picks up 20 or 30 after a stormy night. Claims number of birds killed not so great in recent years as formerly.

COFFIN ISLAND (*Post Office, Liverpool, Queens County, N.S.*).—This station is situated on an island about 2 miles from nearest point of mainland, has an elevation of possibly 50 feet with a revolving light flashing once in every 7 seconds. Keeper has been in charge for 13 years during which time he has picked up only 4 or 5 birds. States that he frequently finds the glass smeared with grease and feathers on mornings following stormy or foggy nights during the migrations. Believes the birds are killed and fall into the sea, and suggests that they are probably "Petrels".

MARIE JOSEPH (*Post Office, Marie Joseph, Guysborough County, N.S.*).—Situated on a small island with an elevation of 30 feet above high water. The light is a fixed white dioptric. Casualties here reported as slight. Two or three birds frequently found after a stormy night during migration, chiefly "Petrels and a few small land birds."

CROSS ISLAND (*Post Office, Lunenburg, N.S.*).—This is a revolving light, situated on the southeast side of Cross island, with an elevation of 100 feet, off Liverpool bay. Keeper states that mortality at this station is greatest during spring season, particularly on foggy and stormy nights. Finds both land and sea birds but not more than three or four at a time. "Birds have severe bruises about the heads and sometimes broken necks," and the number of birds killed appears to be increasing.

GULL COVE LIGHT (*Post Office, Whitehead Island, Charlotte County, N.B.*).—Situated on the

south side of the island, facing bay of Fundy, has an elevation of 80 feet, character of light not stated. Keeper states that very few birds are killed here, not more than three or four in a year. These occur in the spring chiefly on foggy nights, and are killed "by flying against the glass and knocking out their brains." Species mentioned "Snipe and Petrels".

SCATERI ISLAND (*Post Office, Scateri, C.B., N.S.*).—This station is situated on the west point of Scateri island, has an elevation of 90 feet, has a revolving light. About ten birds are picked up during the year, chiefly on foggy nights in June and July. Keeper states that they appear to flutter about the light until they fall exhausted to the ground. As to species, he mentions "small and birds, gulls, and sea fowl."

BRIER ISLAND LIGHT (*Post Office, Westport, Digby County, N.S.*).—Has a revolving light with an elevation of 94 feet, on the western point of Brier island. The officer in charge claims that he has found as many as 60 birds following dark, foggy, or stormy nights. They are killed by flying against the glass and striking the leeward side of the light. No marks on birds picked up, but feathers and blood are found sticking to the glass frequently. Keeper unable to identify species but says "they are all small land birds."

NEGUAC (*Post Office, Tabusintac, Northumberland County, N.B.*).—Situated on an island in Neguac bay three miles from the mainland. A fixed light. Elevation not stated. Damage to bird life at this point is slight. Keeper states that "a few small land birds are killed during the year, chiefly on stormy and foggy nights."

ANNANDALE (*Post Office, Annandale, P.E.I.*).—This station is located on the mainland of Baughton bay, Kings County, P.E.I. There are two lights, one above the other, the higher being at an elevation of about 80 feet. Keeper reports "one bird only killed in ten years. Species, Junco."

COUNTRY HARBOUR (*Post Office Drum Head, Guysborough Co., N.S.*).—A revolving light situated on a small island about 8 miles from the entrance of Country harbor, elevated 51 feet. The keeper here has been in charge for about 13 years. The year following his appointment he picked up one morning 998 "Yellow Birds" and on another occasion he picked up 8 Black Ducks, but the species which appears to suffer the most are Mother Carey's Chickens (Leach's Petrels). He further reports "... about 13 years ago a very powerful light was installed here and while that light was in operation the Yellow Birds and the Black Ducks were killed and many 'Careys,' but

four years ago the powerful light was taken down and one of less power was installed and since the new light there have been very few birds killed." This also is a breeding place for the "Carey Chicken."

SOUTHERN WOLF (*Post Office, Wilson's Beach, Campobello, Charlotte County, N.B.*).—We have here a revolving light, located on South Wolf island, about six miles from shore, in the bay of Fundy, between Grand Manan and the mainland. The keeper states that on stormy and foggy nights during spring and fall considerable numbers of birds are frequently killed. These fly against the glass in a confused and dazed fashion and finally drop exhausted to the ground. Some of them remain on the ground stupefied until daylight when they are able to fly off, while others are found dead with no visible injury. He is not able to give any definite information as to species but claims to have noticed many small yellow and brown ones, which he describes as land birds.

MARTIN HEAD (*Post Office, Martin Head, St. John County, N.B.*).—This is a revolving light almost surrounded by water at high tide, with an elevation of 140 feet. The officer in charge of this station reports that birds are sometimes killed during March and April. He has picked up as many as 25 on a single morning. These are found dead on the ground, chiefly after foggy nights and are described as "chiefly small yellowish birds". The light is surrounded by an iron rail.

CHANCE HARBOUR LIGHT (*Post Office, Chance Harbour, St. John County, N.B.*).—This light is situated on the mainland at an elevation of 25 feet. The keeper states that during the eight years he has been there he has found but twelve dead birds which he is inclined to believe were destroyed by flying against the glass. These were all of the same species, "small birds of a dark yellow colour, probably summer warblers." Of the dozen birds found dead, three were found at one time and nine at another after a high wind, from the northeast. No casualties have been noted for the past three or four years.

GRANDOON FLATS RANGE (*Post Office, The Wil- lows, Northumberland County, N.B.*).—This station is equipped with two fixed lights, one at an elevation of 20 feet and the other at 65 feet, one on an island and one on the mainland. The officer in charge of this station reports very few birds killed during his experience. The few that he has discovered were apparently killed by coming in contact with the glass, during foggy and stormy nights and are described as "land birds and grey birds."

SHEDIAC NORTH CHANNEL (*Post Office, Shediac, Westmorland County, N.B.*).—Situated at an elevation of 50 feet, on the mainland, with a revolving light. The keeper reports that during the spring on rare occasions, birds are destroyed by coming in contact with the glass. Concerning the identity of these birds, he makes the following statement, "I do not know the names of the birds killed here, but they were land birds, with white stripe on head, about the size of a lark."

DREW'S HEAD LIGHT (*Post Office, Beaver Harbour, Charlotte County, N.B.*).—This light is described as occulting white light 25 millimeters diamond vapor burner, and is situated on the mainland, on the western shore, at the mouth of Beaver harbour. Elevation not stated. Six dead birds found in 18 years.

PARTRIDGE ISLAND (*Post Office, St. John, N.B.*).—This station is equipped with a revolving light, 55 millimeter vapor. Situated on Partridge island, at the entrance to St. John harbor, at an elevation of 127 feet. One bird has been killed here in 9 years. This was a small land bird.

ESQUIMINAC AND FOG ALARM (*Post Office, Esquiminac, Northumberland Co., N.B.*).—This station has a fixed light, at an elevation of 75 feet, and is situated on the mainland, visible for a distance of 15 miles. The damage here seems to be above the average. The keeper reports having picked up Brant and Geese with broken wings and many small land birds with heads badly battered. The greatest damage appears to have occurred as usual on foggy and stormy nights.

FORT MONCTON (*Post Office, Port Elgin, N.B.*).—This station has a fixed light, at an elevation of 40 feet, and is situated on the mainland. Only 3 or 4 birds have been killed during the year and these are described as small land birds which apparently met their death by flying violently against the glass.

CAPE SPENCER LIGHT AND FOG ALARM (*Post Office, Mispec, St. John Co., N.B.*).—We have at this station a revolving light of 35,000 candle-power, giving a ten-second flash. It is situated on the mainland, at an elevation of 330 feet above the sea. During the past 10 years 2 "Cranes" (presumably Blue Herons) have been picked up on the ground below the tower. The keeper states that a former attendant who had been in charge of this light for 34 years also found a Crane lying dead at the foot of the light during the month of August. No other species were reported.

RICHIBUCTO BAR (*Post Office, Richibucto, Kent, N.B.*).—This is a fixed light and in the ten years

the officer has been in charge only one bird has been killed.

PORTAGE ISLAND (*Post Office, Burnt Church, Northumberland Co., N.B.*).—The light at this station is a diamond vapor lamp, 35 millimeter occulting, situated on an island at the entrance of Miramichi bay, at an elevation of 45 feet above water level. During the past 30 years, the attendant reports only 2 birds killed, one of these being a Brant and the other a small land bird. The Brant was killed by coming in violent contact with the glass.

JURIMAIN (*Post Office, Bayfield, Westmorland Co., N.B.*).—This light is situated at an elevation of 32 feet, on an island, and is a fixed red catoptric type. Previous to the installation of a new light 12 years ago, 3 birds were found dead. Song Sparrow, Robin, and Swallow. None have been discovered since the new light was installed. The birds were killed on stormy nights in the autumn.

ST. ANDREWS (*Post Office, St. Andrews, N.B.*).—This station is equipped with a fixed light, and is situated on the mainland at the end of a bar in Passamaquoddy bay. On foggy nights during July and August a few small land birds are reported as having been picked up each year. Not over a dozen in any season.

WEST POINT MAIN (*Post Office, West Point, P.E.I.*).—The light here is of the revolving type, and is situated on West Point, P.E.I. The keeper states that small land birds are sometimes killed at this station on foggy nights but he has no record of numbers or species.

POINT PRIM (*Post Office, Point Prim, P.E.I.*).—This station has a fixed vapor light and is situated on the mainland. During the fall on dark foggy nights a few birds have been killed. No numbers or species are stated but the officer in charge mentions he has seen them fluttering around the glass until they have become exhausted and fallen to the ground.

WOOD ISLAND MAIN (*Post Office, Glen Forest, Lot 52, P.E.I.*).—The light here is of a fixed type, situated on an island, at an elevation of 60 feet. The keeper who has been in charge for 10 years reports that during the autumn following stormy nights possibly 20 birds a year are killed. He has discovered them with "injured heads" and they are mostly land birds. He recalls having found but two "sea birds" in ten years.

GILEERT POINT (*Post Office, Gilbert Point, Pictou Co., N.S.*).—This is a red light of fixed type, situated on the mainland at an elevation of 40 feet. The keeper making the report has been in charge for 18 years and during that time has

found but one bird which was killed by the light. He describes this as a small brown bird, which suggests a land bird.

PORT FELIX (*Post Office, Port Felix, Guysborough Co., N.S.*).—This station is situated on an island near the entrance of Tor bay, equipped with a fixed light and has an elevation of approximately 40 feet. The mortality to birds here is reported as very slight and occurs mainly during March and April. The species found are reported as "sea birds" and were found after foggy nights with heads damaged as though having come in contact with the glass.

OWLS HEAD (*Post Office, Owls Head, Halifax Co., N.S.*).—This light is of the revolving type and is situated on the mainland. A few birds have been picked up here in past years but none recently. The keeper speaks of frequently having noted feathers sticking to the glass. The birds were described as "land birds, such as blue-bird, grey-bird and Goldfinch."

SAMBRO LIGHT (*Post Office, Sambro, Halifax Co., N.S.*).—This station is equipped with a fixed light situated on the mainland near the entrance of Halifax harbour. Has an elevation of 140 feet and is visible 17 miles. Very few birds have been killed at this station and the number appears to be decreasing, none having been found in recent years.

HARBOUR BOUCHE (*Post Office, Harbour au Bouche, Antigonish Co., N.S.*).—Two lights at this station, one red and the other white. Both situated on the mainland at an elevation of 30 feet. During the seven years that the keeper there has been in charge he has found but one bird which he describes as a crane, undoubtedly meaning a Great Blue Heron. It was found with a broken neck following a night of fog and storm. The lights at this station are of the fixed type.

WYCOCOMAGH (*Post Office Wycocomagh, Inverness Co., N.S.*).—A fixed light situated on the mainland at an inlet of Great Bras d'Or lake at an elevation of 31 feet. The attendant reports small land birds having been killed, "swallows and white-tailed sparrows, but not more than 12 in a few years." These were killed on thick foggy nights in summer time. The species referred to as "white-tailed sparrows" were probably juncos.

CAPE NORTH (*Post Office, Bay St. Lawrence Victoria Co., N.S.*).—This is a white light with intermittent five-second flashes. Situated at the northern extremity of Cape Breton island at a elevation of 137 feet. The officer in charge reports that not more than a dozen birds per year,

on an average, are killed at this light. These comprise both sea and land birds, the latter described as "sparrows." As usual they were found in the morning following foggy or stormy nights in summer. He is of the opinion that the number of birds killed there is decreasing.

PORT BICKERTON (*Post Office, Bickerton, Guysborough Co., N.S.*).—Situated on the mainland, a fixed light at an elevation of 125 feet. The man in charge at this station makes a rather interesting note. "... This light was built 21 years ago at which time I was appointed keeper. It then had an iron railing painted red around the lantern. Frequently quite a number of birds of different kinds were killed and I think they used to hit the railing in flying around the light. But some years ago the railing was torn down and a larger wooden rail was substituted which was painted white and since then I have found very few birds. Sometimes after a stormy night I see spots of feathers and grease on the windows as though the birds had come with force against the glass, but very seldom find any dead birds."

TIGNISH (*Post Office, Tignish P.E.I.*).—This station has a three-reflector light giving an inter-

mittent seven-second flash. It is situated at the most northerly point of Prince Edward Island on the mainland at an elevation of 80 feet. The keeper states that on foggy nights during the autumn five or six small land birds have been known to be killed on a single occasion. He further states that he has found ducks dead at different times at some little distance from the light apparently having been killed by striking the glass and then been swept away by the wind. The small land birds appear to have died from exhaustion having been found dead on the "deck." He also mentions having found a "marsh hen" presumably a Bittern, with a broken bill, dead below the light.

CAPE RACE (*Post Office, Cape Race, Newfoundland*).—This lighthouse is equipped with a revolving vapor light, situated on the mainland 165 feet above sea level. In thick foggy weather and on dark stormy nights during the summer season the keeper reports having found a few "stormy petrels" (presumably Leach's Petrel). Many of these strike the glass and fall injured to the ground. He believes that a considerable number that fall in this manner later recover and fly off.

CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF NORTH-EASTERN LABRADOR

By BERNARD HANTZSCH

"Beitrag zur Kenntnis der Vogelwelt des nordöstlichsten Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechsfundfzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July, 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II. Besonderer Teil (Detailed Part), pages 307-392.

(Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.)

Fulmarus glacialis glacialis L. (p. 389).
Eis-Sturm-vogel.—FULMAR.

Eskimo: *Kakkordluk*, -*lûk*, -*luit* (= poor (or dubious) white, on account of the soiled colouring); Erdmann writes *Kakkuluk*, Weiz, *Kukkerluk*.

Very abundant visitor and migrant on the parts of the sea surrounding our district; said to breed on Button Islands, but certain breeding places are not known anywhere for Labrador.

I doubt the validity of Kjærbling's *Procellaria minor* (Danm. Fugle, 1852, p. 324) as a well-established subspecies in spite of Ridgway, Chapman, and others, on the ground of the abundant material from different regions examined by me in the flesh, and the objections made by me in the case of *Larus glaucus*, which may be expressed still more strongly in the case of *Fulmarus* be-

cause the bird begins breeding very early in the spring and the development of the young takes place exceedingly slowly. It is just as explicable to me, that the complete development of the noticeable beak is only completed after a rather long time. Three specimens in my collection, 1 male and 2 females, which according to anatomical investigation had not yet reached the age of breeding, from the time of July 16th to September 21st, would according to their size most likely show themselves as intermediates between *F. g. glacialis* and *F. g. minor*, that is to say, are not fully developed or small individual specimens. The measurements are as follows: Weight in the flesh: 642-680 g. Total length: about 460 mm. Spread of wings: 987-1080. Wing: 275-317. Tail: 144-154. Wing + tail: 10-30. (p. 330). Length of bill: 36-36.5. Depth of bill at base: 16-18.5. Tarsi: 43-46.5. Middle toe including the 13-14 mm. long claw: 67-70 mm. Iris: dark brown to blackish brown-gray. Bill: ground colour light greenish-yellow, tip often dark brownish-yellow, the whole more or less suffused with blackish. Frequently this colour diminishes very much, but only in exceptional cases disappears entirely. Upon drying of the skin, the black-gray appears stronger. Skin of chin and inner part of bill: pale flesh-colour. Feet: whitish flesh-colour to light brownish-gray; from the

outer side, especially on the tarsi, washed with darker milky-gray. Light and dark individuals are found together as colour variations and are not to be considered as different degrees of age. But the colour of both in adult age becomes purer, more regular and less spotted. The dark variety was on the whole rarer than the light variety. (Compare also the notes about this bird in first part of this work, p. 179).

From September on, flocks of Fulmars numbering up to hundreds, appeared often, and not very shy, swam about on the water together, or more separated, flew down through the air once in a while, only a few meters distance from the boat. They are quiet and good-natured birds, which the natives like to eat in spite of the fact that their flesh never entirely loses the somewhat unpleasant musky taste with which the whole bird reeks. (p. 330).

Puffinus gravis (O'Reilly) (p. 330). *Gros-ser Sturmtaucher*.—GREATER SHEARWATER.

Eskimo: *Kakkordlungoak*, -*âk*, -*at* (-*ngoak* = image, namely of the *Kakkordluk* = Fulmar).

The Greater Shearwater is an occasional summer visitor of northeastern Labrador, but apparently is a far more frequent visitor of Hudson Strait and Ungava Bay. Usually it comes near the land and to the inside of the bays only in storm and fog. Though I observed many specimens on the ocean at some distance from Greenland, Baffin Island, and Labrador, (compare page 178 of this work), I saw not another one on my later excursions. The Eskimos, however, know this shearwater, which according to the published accounts is said to appear frequently on the southern parts of the Labrador coasts in great numbers (compare Townsend and Allen, 1907, p. 319). Bigelow has observed it offshore in large flocks at some distance from land (1902, p. 27), and Turner also calls it abundant from Belle Isle to Resolution Island (1879, p. 103). This note might indeed refer also to parts of the sea at considerable distance from the land. Macoun mentions a specimen collected by Dionne in 1872 on the Labrador coast (I, p. 60), and Missionary Perrett secured a specimen (p. 331) in the summer of 1900 from the region of Okak, which show, however, that these occurrences are in no way usual.

Puffinus griseus stricklandi Ridgw.²⁵ (p. 331). *Dunkler Sturmtaucher*.—SOOTY SHEARWATER.

I have observed some individuals of this form of the Sooty Shearwater, separated as an Atlantic form by Ridgway (Baird, Brewer and Ridgway, Water Birds of N. Amer., II, 1881, p. 390), on the

North Atlantic, even if far from land. Concerning the justification for this subspecific division, I have no judgment (compare, however, Ridgway's notes respecting this in *Auk*, III, 1886, especially p. 267). In like manner Dresser (Birds of Europe, VIII, 1877, p. 254) and Nares (Voyage to the Polar Sea, I, 1878, p. 7), furnish notes concerning the apparent occurrence of this species, designated as *Puffinus fuliginosus*, not very far from the Greenland coast. Certainly the bird also approaches our district as a rare visitor, as I must conclude from the information of the natives. Bigelow found it, along with *P. gravis*, on the Labrador coast at some distance from land (1902, p. 27). Coues in like manner found several specimens on 19th August, 1860 (Proc. Acad. Nat. Sci. Philadelphia, Aug., 1861, p. 243.). Missionary Perrett observed the species abundantly at Okak in the summer of 1900 and secured verifying specimens at that place.

NOTE 1: Kumlien believed that he also observed *Puffinus kuhlîi* (Boie) [Cinereous Shearwater] as common from Belle Isle to Grinnell Bay, southeastern Baffin Island (1879, p. 102). This note would come into consideration for our district. This has, however, been commonly recognized as an error, just as the communication from other sources on the occurrence of the species in Greenland (compare H. Winge, Groenlands Fugle, 1898, p. 312). Kumlien has unfortunately been mistaken in the identification of different species, by which his whole work loses much in value. Herluf Winge has pointed out for him a whole list of evident mistakes for Greenland in an ornithological sense (l. c. p. 28), and Franz Boas says indeed: "The Kumlien account may be used only with the greatest care (Baffin-Land, *Ergänzungsheft* Nr. 80 zu *Petermanns Mitteilungen*, 1885, p. 39).

More probable still is a rare appearance of the European *Puffinus puffinus* (Brünn.), [Manx Shearwater], on the north-east coast of Labrador, especially as the species has also exceptionally been killed in Greenland.

NOTE 2: Unfortunately the identification of the bird taken by Robert Bell near Killiney, Port Burwell, on 25th September, 1884, rests on the confusion of *Puffinus tenuirostris* (Temm.) with a *Fulmarus*, as John Macoun has ascertained (Townsend and Allen, 1907, p. 320).

Procellaria pelagica L.²⁶ (p. 331). *Kleine Sturmschwalbe*.—STORM PETREL [p. 332].

Eskimo: *Kukkiliksak*, -*soâk*, -*suit* (*partim*); etymology not clear, literally translated *kukkik* = claw, -*lik*—furnished with it, -*soak* = large. This does not suit for our species, even if the claws are very sharp. Perhaps the name of another species has been taken over or the real meaning of the -*soak* has been lost. Weiz writes *kukker-luksoak* (-*luk* = bad,) which meaning often disappears.

This bird also appears to reach our district as a rare visitor. The Eskimos do not make any distinction among the Storm Petrels, wherefore it is impossible to secure from them more exact information in this respect. I introduce this species here, because Turner collected two specimens in 1882 in Ungava Bay (1886, p. 253).

²⁵ The 16th Supplement to the A.O.U. Check-List of N. A. Birds, *Auk*, 1912, does not recognize the subspecies *stricklandi*, and the specific name *Puffinus griseus* (Gmelin) is replaced by *Puffinus carneipes* Gould.—R.M.A.

²⁶ Now *Hydrobates pelagicus* (Linnaeus), 17 Suppl. A.O.U. Check-List, 1920.—R.M.A.

Oceanodroma leucorhoa (Vieill.) (p. 332).
Gabelschwängige Sturmschwalbe.—LEACH'S PETREL.
 Eskimo: *Kukkiliksoak*, -soâk, -suit (partim).

The fork-tailed [Leach's] Petrel might touch the coasts of northeastern Labrador, the entrance to Hudson Strait and Ungava Bay, as an occasional visitor, the most frequent of its relatives. I observed it myself, not near land to be sure, but it is well known to the Eskimos of the district, who seldom go far from the coast. Winge writes of this species, that it frequently appeared in Davis Strait and perhaps bred in West Greenland (Groenlands Fugle, 1898, p. 138). Kumlien claims to have observed it at Cape Mercy and in Exeter Sound (1879, p. 102). It breeds here and there on the southern part of the east coast of Labrador, though how far north its breeding places reach, is unknown. Its exceptional strength in flight and its ability to live on the sea far from land, make it suited to long wanderings. (Compare also the notes about this bird in Part I of this work, p. 181).

Oceanites oceanicus (Kuhl.) (p. 322).
Buntfüssige Sturmschwalbe.—WILSON'S PETREL.
 Eskimo: *Kukkiliksoak*, -soâk, -suit (partim).

This species, which wanders about exceedingly far, in spite of its southern breeding places (Kerguelen Land), visits the North Atlantic Ocean and perhaps our district rather regularly during our summer as a rare visitor. Material for evidence is indeed lacking. I mention it only on account of the note by Kumlien, scarcely free of error, who observed this bird, apparently in rather large numbers in August, 1877, on his journey somewhat away from the Labrador coast, northward from Resolution Island (1879, p. 102), and Turner's note, who claims to have seen it (p. 333) likewise on the Atlantic coast of Labrador and especially plentiful, indeed, in spring and autumn (1886, p. 253). These latter notes to be sure are included certainly on an erroneous identification of the species of petrel observed.

Sula bassana (L.) (p. 333). *Bass-Tölpel*.—GANNET.

Eskimo: *Kogsuk* (*Kokjuk*), -sûk, -suit (real name for the swan).

This species also, which does not have its breeding places beyond southern Labrador, may be driven as far as our district only as an occasional visitor. Yet it seems to have been seen by different Eskimos, although confusion with the swan is not quite excluded. Kumlien says that the species has been observed (by him?) from Nova Scotia to latitude 65° north, but not

in Cumberland Sound (1879, p. 94). Authenticating specimens for our district are not known to me, but perhaps there are such for Greenland.

Phalacrocorax carbo (L.) (p. 333). *Kormoran-Scharbe*.—CORMORANT.

Eskimo: *Okaitok*, -tuk, -tut (from *okak* = tongue and *-itok* = to be without, thus "without a tongue," on account of the very small tongue).

Infrequent migrant and probably breeding bird here and there. I observed it on 23rd July east of Button Islands, on 25th July at Resolution Island, and on 5th September in MacLellan Strait. In the latter place a specimen was also shot a short time before. It appears variable, in many years more numerous than in others. It seems to appear most regularly in the autumn, but is almost always very shy and hard to kill. Macoun says that the species breeds plentifully along the whole Labrador coast (I, p. 65), and Kumlien notes it as a regular if not numerous breeding bird in the Cumberland Sound region. In certain years the cormorants are said to appear there quite plentifully and in earlier times their wing-quills were desired for arrows (1879, p. 94).

NOTE: That *Phalacrocorax dilophus* (Sw. and Rich.)²⁷, [Double-crested Cormorant] also visits our district is improbable. I know only one specimen as the most northern appearance on the Labrador coast, secured by Missionary Perrett some years ago from Kipokak at the mission station Maggövik.

Mergus serrator (L.) (p. 333). *Mittlerer Säger*.—RED-BREASTED MERGANSER. (p. 334).

Eskimo: *Pai*, *Paik*, *Pait* (probably from the voice).

Infrequent breeding bird and migrant. On 18th August I observed several breeding pairs with almost grown young on a lake in the hinterland of Takpangajok Inlet, Ungava Bay. The bird is said to breed gregariously on freshwater lakes and to come upon the sea, especially in the inlets, only at the time of migration. Kumlien also notes the species as a regular but not very common breeder in the Cumberland Sound district (1879, p. 94). It may occur in all parts of the Labrador peninsula.

Three Labrador specimens from the region of Hoffenthal, which are in my collection, are characterized as follows: 2 male adults, of spring and late summer, 1904. Wing: 246, 255 mm. Tail: 97, 112. Bill, from the feathering of the forehead in the median line: 56, 61. Tarsi: 41, 44. Middle toe including the 9 and 10 mm. long claws respectively: 67 and 76 mm. Female adult, apparently breeding bird, summer, 1904.

²⁷ *Phalacrocorax auritus auritus* (Lesson) of the A. O. U. Check-List, 1910.—R.M.A.

Wing: 7214. Tail: 93. Bill: 53.5. Tarsi: 42. Middle toe: 64. Claw: 8.5 mm.

The birds which I observed were in the middle of the lake in company of some specimens of *Aethya marila* [*Marila marila*, Scaup Duck]. Even in this completely uninhabited region, only rarely traversed by caribou hunters, they were so shy that we did not succeed in obtaining a single specimen, in spite of the fact that my Eskimo companion lay perhaps an hour patiently behind a rock projection and I tried to drive the birds up to him. The short, harsh *Rrr*, *Rap*, *Raup* was heard repeatedly. They seemed to be in the moult and dived instantly when I sent a chance shot among them at a distance of at least 150 metres, but they did not fly away. The flesh of this merganser is eaten with relish in spite of its fishy taste.

NOTE: *Mergus americanus americanus* (Cass.) [Merganser] does not seem to go up into the treeless districts. Missionary Perrett does not know it on the Labrador coast farther north than the region of Maggövik. The species also breeds apparently more in the interior of the country.

Mergus cucullatus L.²⁸ (p. 334). *Hauben-Säger*.—HOODED MERGANSER.

Eskimo: *Java*, -ak, -at (perhaps from the voice); *Kingoktök*, -tök, -tät (from *kingok*=space between the eyes, -tök=he who has something in large quantity, therefore "he who has a great space between the eyes"); also according to Erdmann *kavjektök*, -tök, -tät (from *kavjek*=skull, thus, "he who has a great mass (feathers) on the skull.").

According to the statements made to me by Missionary Perrett, this is an infrequent migrant and possibly a breeding bird on freshwater lakes. Perrett found it many times on the northeastern coast of Labrador and quite abundant in time of migration. Spreadborough (p. 335) saw a pair in the interior of the country on 16th July, 1896, which probably bred there (Macoun, I, p. 74). I did not have a glimpse of any specimen during my stay.

Anas boschas conboschas Brehm.²⁹ (p. 335). *Stockente*.—MALLARD.

Eskimo: *Mitterluk*, -luk, -luit (partim); *Mittek*—eider duck, -luk—slight, mean; on account of the lesser size).

This species probably visits our district only as an exceptional visitor and usually keeps itself deeper in the interior of the country. Perhaps, however, neither the natives nor the white settler's have noticed it. This is to be expected, particularly when the drakes wear the summer plumage of other rare species of ducks. Kumlien did not

find the bird in Cumberland Sound at all (1879, p. 88) and Missionary Perrett noted only a single occurrence at Maggövik. H. F. Moeschler, who frequently secured skins and eggs through Moravian missionaries, several times offered specimens of this species from Labrador, for example, a male in his catalogues of 1856 and 1872. Turner mentions the species for the south of Ungava Bay and noted it as rarely occurring at Fort Chimo (1886, p. 249). I put down *Anas boschas* on the ground of a skin which I secured from the missionary Merten in Hoffenthal. It is a male nearly finished with moulting, of the autumn of 1905 from Okak, a mission station not very far from our more restricted district.

In accordance with comparison with the careful description and illustration of the Greenland Mallard of E. Lehn Schiöler (*Vidensk. Meddel. fra den naturh. Foren. i Kbhvn.*, 1905, pp. 127-148), this specimen inclines quite clearly to this form, *A. b. spilogaster* Schiöler=*A. b. conboschas* Brehm. To be sure, it does not attain the largest Greenland measurements, but this might be connected with the moulting, not yet fully completed. Wing: 278 mm. Tail: 105. Middle toe, including claw: 60. Outer toe, 56; inner toe, 47. Tarsi: 45. Length of bill, from the middle of feathering of forehead, 53 mm. The specimen seems stronger and larger compared to European birds, only the bill is relatively small and tender. Back spotted very coarsely and in its colour much grayer than the European bird, something which is particularly noticeable on the upper wing. Under parts somewhat darker, in region of the crop not uniformly chestnut-brown, but many feathers bordered with one or two blackish spots, from which appearance Schiöler named the subspecies. On the breast the brown disappears loosely in a point. Whether the specimen under discussion represents a migrant from Greenland or in what degree the form *conboschas* corresponds to the American specimens of *A. boschas* should be investigated still more. Apparently the European specimens of the species are not entirely like the American specimens (compare Baird, Brewer and Ridgway, *Water Birds of North America*, I, p. 493).

Anas obscura rubripes Brewst.³⁰ (p. 336). *Düstere Ente*.—BLACK DUCK.

Eskimo: *Mitterluk*, -luk, -luit (partim).

The Black Duck is a rather rare breeding bird in our district. Farther south, where the vegetation becomes somewhat richer, for example, at George River, it is said to become more abundant, according to the accounts of the Eskimos. D. Wallace also found the species here in the middle of September, 1905, in large numbers, and says that it was apparently a breeding bird ("The Long Labrador Trail," *Outing Mag.*, Vol. 49, 1907, p. 434). Turner notes it as not common

²⁸ *Lophodytes cucullatus* (Linnaeus) of the A. O. U. Check-List, 1910.—R.M.A.

²⁹ *Anas platyrhynchos* Linnaeus of the A. O. U. Check-List, 1910.—R.M.A.

³⁰ *Anas rubripes* Brewster, A. O. U. Check-List, 1910.—R.M.A.

in the districts of Hudson Strait, where, however it doubtless breeds (1886, p. 249). On 7th July Spreadborough saw a few individuals and found a nest with four eggs nearly hatched in the northern part of Labrador (Macoun, I, p. 77).

Whether this subspecies, proposed by William Brewster in 1902, and described in *The Auk*, XIX, p. 184, but many times questioned, is tenable, I am unfortunately not in the position to investigate from lack of material. Brewster says that a specimen collected on 1st July, 1884, in Ungava Bay, by Turner belongs to this subspecies (*l. c.*, p. 187); and the one male adult of my collection from northeast Ungava Bay (Tuppertalik), 14th August, 1906, also inclines to *A. o. rubripes*.

It shows the following measurements: Weight in the flesh: 1350 g. Total length: 595 mm. Spread of wings: 950. Wing: 275. Tail: 109. Tail + wing: 21. Bill, from the middle of feathering of forehead: 56. Tarsi: 44. Middle toe including the 8.5 mm. long claw: 61 mm. Iris: black-brown. Bill: yellow-green, nail blackish. Feet: pale slate-red, webs and soles washed with blackish. The stomach contained little stones and remains of indeterminate creatures (Rörig).

I observed single males several times, the first on 10th August, on a long, drawn-out, river-like, brackish-water lake south of Killinek. This bird was rather restless, and flew up somewhat awkwardly on high when he was unsuccessfully shot at, with a deep *Quakquak*, and away toward the interior of the country. Because of his behaviour I suspected that he had a female and young near by. In two other cases I met specimens in shallow waters of inlets. These birds were quiet and rather slow in their movements, but always carefully on their guard. My companion shot the specimen mentioned above at a great distance. The species was well known to him and had apparently often come before his gun. The flesh of the bird boiled in sea water tasted quite good to me.

Nettion crecca carolinensis (Gm.)³¹ (p. 336). *Amerikanische Krickente*.—GREEN-WINGED TEAL. (p. 337).

This species appears to visit our neighbourhood only as an exceptional visitor. The Eskimos at Killinek did not know the bird. Farther south on the Labrador coast it is said to breed freely (Macoun, I, p. 81), but perhaps only rarely or deeper in the interior of the country. Turner states that young of the species able to fly were captured late in July at Fort Chimo (1886, p. 249). Missionary Perrett secured only one specimen killed at Maggövik. In Greenland, according to Winge, contrary to the older record,

there has appeared as far as can be learned only the American form, *N. c. carolinensis* (Groenlands Fugle, 1898, p. 76), and the records concerning the occasional appearance of *N. c. crecca* (L.) [European Teal] in the North Atlantic district of America also need careful examination for every single case. My companion on 8th September, 1906, shot an apparently rather young bird, certainly a male, in a little inlet at Opingevik, the northeastern point of the mainland of Labrador.

So far as comparison may be made with this bird, which shows no kind of trace of the galar dress, with European and American specimens of *Nettion crecca*, it is a specimen of the American form, because of the darker, grayer upper parts, which are transversely waved with finer whitish-gray as well as because of the darker, more heavily spotted lower parts. I believe on the whole definitely, that with good material for comparison in hand, certain differences may also be determined between females, juveniles, and males in the summer plumage of both forms. The measurements of the specimen mentioned are as follows: Weight in flesh: 295 g. Total length: 335 mm. Spread of wings: 580. Wing: 177. Tail: 67. Tail = wing. Bill: 35. Tarsi: 29. Middle toe including the 6 mm. long claw: 36 mm. Iris: yellow-brown. Bill: dark greenish-gray, on the sides vivid ochre-yellow, lower mandible somewhat paler yellow. Feet: greenish-gray, webs blackish. The stomach contained sand, pieces of feathers, and undeterminable remains of creatures (Rörig).

I did not see the bird myself, since I was working in the tent. It is said, however, not to have been very shy. An additional specimen of the species was not found, for which reason, it might have been a case of a stray individual.

Dafila acuta (L.)³² (p. 337). *Spiess-Ente*.—PINTAIL.

Eskimo: *Jrugak*, -kak, -kat (etymology not clear).

The Pintail may likewise only visit our district as a rare visitor and not appear more frequently until farther south on the Labrador coast, without breeding in that place. Labrador eggs, which are stated to belong to this bird, are, according to all appearances mistakenly identified. Chapman indeed says expressly that nothing is known of its breeding on the Atlantic coast (Birds of Eastern North America, 1906, p. 106). (p. 338) According to my information certain Killinek people seem to know the species, although during my stay in the region no specimen was captured. Turner secured a young female of the Pintail at Fort Chimo (1886, p. 249), and Missionary Weiz likewise counts it for northeastern Labrador (G.

³¹ *Nettion carolinense* (Gmelin) of the A. O. U. Check-List, 1910.—R.M.A.

³² *Dafila acuta tzitzohoa* (Vieillot), American Pintail, 18th Suppl. to A. O. U. Check-List, 1924.—R.M.A.

Neumayer, *Intenr. Polar-forsch.*, I, 1891, Appendix p. 101). H. F. Moeschler brought it repeatedly into trade during most of the different seasons from Labrador (catalogues from 1854 to 1880). Macoun says that specimens are known from Davis Strait (I, p. 85), and Winge also states that this species has been taken many times in western Greenland (Groenlands Fugle, 1898, p. 78). On the other hand, Missionary Perrett

noted only one occurrence at Maggovik. I received the skin of a juvenile male of September, 1904, at Hoffenthal, the same place where Townsend and Allen also saw two specimens (1907, p. 328).

My specimen has the following measurements:
Wing: 257 mm. Tail: 125. Bill: 52. Tarsi 42. Middle toe including the 7 mm. long claw: 52 mm.

(To be continued)

NOTES AND OBSERVATIONS

FURTHER NOTE ON THE BRONZED GRACKLE AS A FISHERMAN.—I might add a recent observation to the interesting notes of Messrs. L. L. Snyder and P. A. Taverner which were in the February, 1928, issue of *The Naturalist*. On March the 24th, I saw some twenty Bronzed Grackles on the sandy bank of a small stream flowing into Grenadier Pond, High Park, Toronto. They were busily stabbing at something in the shallow water at the edge. Through my glasses I could see that each bird was making a little pile on the sand of that which he took from the water. I watched the nearest bird until he had gathered several together and was about to eat them, as I had seen his fellows do with their piles. Making a great commotion, I frightened all the birds away and examined the intended lunch. It consisted of several specimens of the Amphipod *Gammarus fasciatus* Say*. These are freshwater Crustaceans living on the bottoms of small streams. They are brownish in colour, about $\frac{3}{4}$ of an inch long, with laterally flattened bodies, and swim from the deeper water to bask in the sun in the shallower. And here they were interrupted by the Grackles.—LORUS J. MILNE.

Determined by Dr. E. M. Walker, Royal Ontario Museum of Zoology.

FURTHER NOTES ON THE STARLING IN ONTARIO.—The object of the following remarks is to place on record two instances of the occurrence of the Starling (*Sturnus vulgaris*) in Ontario, which extend considerably northward of the range of this species in this province.

On the map showing the distribution of the Starling in Ontario as known at May, 1926, appearing in Harrison F. Lewis's excellent and timely publication*, the most northern record of its occurrence in the province is given as at Orillia in Simcoe county. No further extension of its range northward was reported until February 15, 1927, when a notice appeared in the *Toronto Globe* of that date by Dr. J. W. Marshall of Thessalon, Algoma district, in which he reports a Starling

having been found dead at Thessalon about February 10. The bird was turned over to him for identification and was sent to the store of O. Spanner and Co., Toronto, where it was mounted and subsequently returned to its owner. Dr. Marshall stated that the bird was found on a day on which the thermometer registered 42° below zero. The appearance of this Starling in mid-winter so far north of the known range of the species (Thessalon being approximately 230 miles northwest of Orillia) is remarkable. Since no further reports of Starlings have been received from Thessalon or vicinity, the above occurrence can only be considered as accidental.

At North Bay, however, which is approximately 120 miles due north of Orillia, the Starling appeared for the first time in the spring of 1927 and by so doing constituted a clear case of a considerable northward extension of range. I am indebted to Mr. C. Ramsay, of the Normal School, North Bay, for the information which enables me to place this occurrence on record. Mr. Ramsay, in a letter to me dated April 2, 1928, says: "... during the spring of 1927 I came across seven pairs of Starlings, nesting in places just outside of the city. Two nests were in old flickers' holes in telegraph poles, the others in holes in old elm trees. I cannot say whether they have spent the winter here. I have seen none in the city..." Mr. William Ricker informs me that he and Mr. Ramsay saw a flock of 10 Starlings near North Bay in mid-September, after which none were seen.

Mr. Lewis (*loc. cit.*) has recorded a flock of 500 to 600 Starlings, noted at Beamsville, Lincoln county, on April 5, 1926, by J. I. Merritt, as the largest flock of these birds to be reported anywhere in Ontario up to that time. A flock of about the same size (estimated to contain approximately 500 birds) has been reported to me by Mr. Allan Twining and may be worth recording here in view of the fact that the bird was unknown in Ontario until less than 10 years ago. This

flock was observed by Mr. Twining one evening about September 1, 1927, at Orr lake, Simcoe county, going to roost in the marsh there. At the time Grackles were present in immense flocks, by the thousands, but the flock of Starlings did not mingle to any extent with them, although other small parties of Starlings were seen associating with the flocking blackbirds at the marsh.—JAS. L. BAILLIE, JR., *Royal Ontario Museum of Zoology, Toronto.*

**A Distributional and Economic Study of the European Starling in Ontario, Univ. of Toronto Studies, Biological Series, No. 30, Toronto, 1927.*

THE SPREAD OF THE EUROPEAN STARLING.—The Starling is spreading in Canada. Every year it is reaching new localities. Never again can the facts of the spread of this species be observed and recorded, for it will undoubtedly hold for all time the territory it gains year by year. Mr. Harrison F. Lewis* records its early spread in a part of Canada. Naturalists everywhere in Canada should watch for the appearance of Starlings, observe their habits, and their migrations if any, study their effect on native species, learn about their food habits, and record their numbers. All information respecting the spread of this species in Canada should be published where it will not be lost, and before it is forgotten. Facts which in themselves appear unimportant may add materially to the scientific knowledge of how this stranger species claims as its own a new territory. Birds of all times have been occupying new territory wherever circumstances favoured them. Here is a modern chance to learn how a species rises to dominance.

Needless to say, facts concerning the increase of the Japanese Starling in western Canada are of equal importance to naturalists.—HOYES LLOYD.

**A Distributional and Economic Study of the European Starling in Ontario, published by the Librarian, the University Library, University of Toronto.*

BIRD BANDING IN JAPAN.—It has been learned from an address* presented at the Pan-Pacific Educational Conference by S. Uchida, Dr. Agr., Ornithologist to the Department of Animal Industry, Tokyo, Japan, that systematic bird banding has been conducted in Japan since the year 1924.

The manner in which this work is conducted

in Japan is similar to methods used in Canada and the United States, except that no trapping stations have been established in Japan. However, in that country about ten thousand fowlers have been licensed to catch game birds by using traps, nets, etc., and advantage is taken of this practice to secure birds for banding, and to obtain information regarding banded birds that may be trapped.

Interesting returns can be expected from the various countries through which Japanese birds migrate, and it is quite possible that sooner or later some birds will be found in Canada carrying Japanese bands. These bands are of aluminium, inscribed with a number and "NO RIN SHO", signifying the Ministry of Agriculture and Forestry. If bands of this kind are found in Canada, the finder should report them to the National Parks of Canada Branch, which is in charge of Canadian bird-banding records, and the necessary steps will be taken to report them to the proper Japanese authorities.

From January, 1924, to December, 1926, seventeen thousand four hundred and twenty-eight birds have been banded, with five hundred and fifty-five returns, approximately 3.2 per cent of the banded birds. In 1924, 5,582 birds were banded and 240 returns were received, in 1925, 6,759 banded and 196 returns received, and in 1926, 5,086 banded and 116 returns received.

The following birds have so far been banded in Japan: Grey Heron, ten species of ducks and Mergansers, Water Hen, Quail, Bar-tailed Godwit, Wandering Tattler, Brown-eared Bulbul, Dusky Ouzel, Eye-browed Ouzel, Pale Thrush, and ten species of the genus *Emberiza*, or thirty species in all.—HOYES LLOYD.

**The Mid-Pacific Magazine, Vol. XXXIV, No. 4, p. 317.*

TRANS-ATLANTIC BANDED PIGEON RECOVERY.—In connection with the keeping of the Official Canadian Record of Wild Bird Banding Returns, the National Parks of Canada Branch, Ottawa, has had brought to its attention an interesting account of a trans-Atlantic pigeon recovery. This pigeon, wearing a band with the inscription "NURP 26 U C 4158", was banded by James Gaw, Newtownards, County Down, North Ireland, and was lost in a race from Penzance, Lands End, England, in June. On June 23, 1927, it was reported shot on the east end of Belle Isle, Newfoundland.—HOYES LLOYD.

EUROPEAN HARE AT COLLINGWOOD.—On June 9, 1928, a European Hare was seen by Dr. Paul Harrington and me at the edge of a small extent of woods at Collingwood, on the south shore of Georgian bay. The hare was watched at close range, where its large size and characteristic markings could be observed. This shows the animal to have reached Georgian bay and it will be interesting to follow its spread in Ontario. On the same day a Cottontail and a Varying Hare were seen.—JAS. L. BAILLIE, JR.

AN EARLY DATE FOR THE GRASSHOPPER SPARROW AT TORONTO, ONTARIO.—The Grasshopper Sparrow is locally not uncommon in the Toronto region during some summers.¹ The irregularity of its occurrence however gives it the status of a rare bird and little data is available concerning the dates of its arrival and de-

parture. The earliest spring record for Toronto is a specimen in the Museum's collection taken at Ashbridge's Bay by John Edmonds on May 24, 1890.²

The average date of arrival of the species in the London region is May 10, the observations covering a period of seventeen years, the earliest date is April 7, 1921.³

On April 7, 1928, the writer secured a singing male at Ashbridge's Bay, Toronto. This specimen by coincidence gives Toronto an early date equal to the London record made seven years previous.—L. L. SNYDER, *Royal Ontario Museum of Zoology, Toronto.*

¹ THOMPSON, STUART L., *Occurrence of Grasshopper Sparrow at Toronto, Ontario.* *The Canadian Field-Naturalist*, Vol. XLI, No. 4, pp. 88, 89.

² FLEMING, JAMES H., *Birds of Toronto, Canada, Auk*, Vol. XXIV, No. 1, p. 80.

³ McIlwraith Ornithological Club, *Spring Arrival Dates of Birds of London District*, 1927.

BOOK REVIEWS

FUR-FARMING FOR PROFIT, by Frank G. Ashbrook in charge, *Division of Fur Resources, Bureau of Biological Survey, U.S. Department of Agriculture, Washington, D.C.* New York: The Macmillan Company, 1928. All rights reserved. pp. i-xxiii, 1-300, 127 illustrations. (Issued by The Macmillans in Canada, St. Martin's House, Toronto, price \$4.50).

This is a book from the "Rural Science Series" which is of much interest to Canadians. Canada has long been among the leaders of fur-producing countries, and every province shares in the benefits of this natural raw fur production. The natural range of many of our most valuable furbearers has been reduced or destroyed by the spread of lumbering and agriculture. In connection with the enormously increased demands and consequently higher prices during recent years trappers and fur-traders have penetrated the most inaccessible and remote regions with supplies, weapons and traps of deadly efficiency. In spite of protective regulations and nominal supervision of wild life, high prices for fur establish in effect a bounty on the heads of some of our most valuable species. Their existence hangs on a whim of fashion, and it becomes more and more doubtful whether some of these species can be preserved for long in a wild state.

The solution of the problem of maintaining a steady annual supply of the furs which are desirable for comfort in a cold climate and an adjunct

of fashion elsewhere, appears to rest in the development of the fur-farming industry, and in this work Canada, and particularly the Province of Prince Edward Island, has been a pioneer. With the initial advantage of a climate suitable for the growth of a superior quality of fur, Canadians have the best opportunities for success in this line. Beginning with scattered individuals, many of them working in a secretive and non-co-operative manner, the industry has spread rapidly and worked through a period of wild-cat speculation. Various publications have been issued by fur-farmers or dealers for propaganda purposes and for selling both breeding stock and paper stock in companies, and the general public has been confused with many varying ideas.

The Commission of Conservation in Canada, in 1913, issued a valuable book on "Fur-farming in Canada", by J. Walter Jones, sketching the history of the industry up to that time, but great progress has been made since in development of practical and economical methods of handling, control of animal diseases, improved methods and uniformity of pelting, and the marketing of pelts. The breeders are more inclined to co-operate than formerly, breeders' associations have been formed for mutual assistance, and pedigrees of stock are registered.

As fox-farming is the most important and the

highest developed branch of the industry, it receives the most consideration in the book under review, and the author discusses in detail, kinds of foxes, behaviour of foxes in captivity, selecting a fox-farm site, plans of ranches, types of pens with plans for building and bills of material, dens or kennels, guard-fences, additional equipment, essentials of breeding and selecting stock, methods of feeding, diet, etc. He also discusses the raising of fishers, martens, minks, otters, skunks, raccoons, opossums, beavers, muskrats, chinchillas, and Karacul sheep, going as well into the nature and status of fur-farming, its history, fur-farming areas, recommendations to beginners, transporting live animals, pelting, marketing pelts, hygiene in fur-farming and legal considerations.

While there is much of incidental interest to the naturalist bearing on the habits of the different animals, the subject is in general limited to the principles of feeding, breeding, and handling fur animals. The author, a trained observer and a recognized authority on the subject, has spent several years working up this subject for the Biological Survey, and has had exceptional opportunities to visit and discuss the problems with the principal fur-breeders of the United States and Canada. He has kept in touch with the associations of the fur-trade and the practical commercial relations between the producers and the purchasers, with the developments along these lines in all countries. It may be noted that fur-breeding experiments are being carried on in Norway, Sweden, Russia, Esthonia, and other countries of central Europe, as well as in Japan and South America. Working under such auspices, he has treated the subject in a broad way from an impartial standpoint. Anyone who contemplates raising fur animals, or handling live wild animals for pets, or capturing them for sale or transport, even in the smallest way, will find much of interest in this book, and by careful reading will avoid many mistakes.

All branches of farming, ranching, and animal industry in general, have built up a fund of knowledge by expensive ventures and experiments which are costly to the individual. Experience is said to be the best teacher, but the tuition fees are often the highest, and up-to-date farmers are finding that it pays to avail themselves of the agricultural bulletins and controlled researches of the experimental farms, and fur-farming is no exception to this rule. All beginners have difficulties in a comparatively new business, but much time, money, and trouble may be avoided by advance information on the elementary difficulties, their obvious causes, and methods

for their remedy or prevention. The novice who is warned of the ordinary difficulties has the better chance of weathering the first stages of the game and of advancing to the fascinating unsolved problems which promise an interesting occupation and financial profit to the intelligent and successful experimenter.—R. M. ANDERSON.

MAMMALS AND BIRDS OF MOUNT RAINIER NATIONAL PARK, by Walter P. Taylor, Biologist, Bureau of Biological Survey, U.S. Department of Agriculture, and William T. Shaw, formerly Professor of Zoology, State College of Washington, with illustrations by William L. Finley, Irene Finley, William T. Shaw, J. B. Fleit, and others. United States Department of the Interior, Hubert Work, Secretary. National Park Service, Stephen T. Mather, Director. United States Government Printing Office, Washington, 1927. pp. i-viii, 1-249, figs. 109 (halftones; 14 of typical scenery, life zones, etc.; 50 of mammals, 45 of birds), and large folding contour map, with life zones.

Both of the authors of this valuable nature handbook are well known to our readers. Dr. Taylor will be remembered for his excellent suggestions for field study of life histories of mammals, which have been quoted extensively in these columns, as well as for his various monographs of Western mammals. Professor Shaw was the author of two papers prepared at Washington State Experiment Station at Pullman, giving the results of his extensive field research on a species of mammal abundant and of economic importance in Western Canada, namely, "The Home Life of the Columbian Ground Squirrel," *Canadian Field-Naturalist*, xxxviii, Nos. 7, 8, September and October, 1924, pp. 128-130, 151-153, 6 figs.; also "The Hibernation of the Columbian Ground Squirrel," *ibid*, xxxix, Nos. 3, 4, March and April, 1925, p. 56-61, 79-82, 11 figs.

Mount Rainier National Park is situated in the Cascade Range in the State of Washington, the western border being about 40 miles southeast of Puget Sound, and the northern border 136 miles from the southern boundary of the Province of British Columbia, Mount Rainier itself lying about 12 miles west of the main divide of the Cascades. The fauna and flora of the park are very similar to those met with in the southwestern part of British Columbia. In fact, at the same approximate altitudes, the mammals of Mount Rainier park with a few exceptions noted later, may be matched in the region east from Huntingdon, Sumas, Cultus Lake, Chilliwack, Lihumpton Park, Hope, Hope-Princeton-divide, etc. A collection of 914

small mammals collected for the National Museum of Canada in the above-mentioned parts of British Columbia by C. H. Young and H. M. Laing during the summer of 1927, show most of the smaller species of the Mount Rainier region and a checking up of our other records from the same district shows the absence of remarkably few of the 54 species listed for Mount Rainier National Park.

Among the few mammals recorded from Mount Rainier park, but not yet recorded from southwestern British Columbia, are the Coast mole (*Scapanus orarius orarius*), replaced in British Columbia locally by Scheffer mole (*S. orarius schefferi*); bob-cat (*Lynx fasciatus fasciatus*), probably still to be heard from in British Columbia; Olympic lemming mouse (*Phenacomys intermedius olympicus*), replaced by *P. intermedius intermedius*; Oregon meadow mouse (*Microtus oregoni oregoni*); Rainier meadow mouse (*M. oregoni cantwelli*), Rainier pocket gopher (*Thomomys douglassii shawi*), Rainier mountain beaver (*Aplodontia rufa rainieri*), represented in southwestern British Columbia by two closely allied subspecies, *A. rufa rufa* (around Chilliwack-Sumas) and *A. rufa columbianus* (around Hope, B.C.), little chipmunk (*Eutamias amoenus caurinus*), replaced by *E. amoenus felix*; Douglas squirrel (*Sciurus douglassi douglassi*), replaced by *S. douglassi cascadenis*. Six shrews and four bats are found to be the same in both areas, as well as most of the voles and other smaller mammals, and virtually all of the large mammals are the same. The mammal fauna of a region is generally constant in number of species, however they may fluctuate in numbers of individuals, and as they do not migrate to any great extent, the local races stay in their places, outside of slow shifting of range due to changing environment. The birds of the two regions are practically the same, and the resident and breeding birds are usually constant, although birds of course are able to range widely during migration or are driven by storms, so that new records are apt to occur in any avifaunal list.

On the whole, therefore, the Mount Rainier Park book is one which will prove extremely valuable to any naturalist living in southwestern British Columbia or visiting in that region. Such local lists, or accounts of the fauna of any limited region are of extreme value to any visitor or to anyone studying local material. There are compendious works on North America as a whole, or the Western States or Provinces, but from their size and completeness are confusing to a field student, particularly to a non-collector. The local treatise, by eliminating species which are

extra-limital to the district, makes field identification much easier, and in some cases very simple. It is obviously simpler, for example, to pick out the two chipmunks found in this particular locality, than to read about fifteen or twenty chipmunks found in Western North America.

Another small feature which seems to be commendable, in this work which is packed so full of meaty suggestions, is that in the numerous instances where a species of mammal or bird bears a name derived from some person, perhaps the describer of the species or some person honoured by his friends in the zoological world, such as Townsend mole, Trowbridge shrew, Bendire shrew, Cassin purple finch, and Gambel sparrow, a footnote carries a brief biographical sketch giving their claims to such fame. Owen Wister in one of his hunting sketches comments rather caustically on certain subspecific distinctions, hinting that the vanity of certain naturalists may enable their names to ride down to posterity on the back of some unoffending sheep or goat. Be that as it may, the general user of a popular handbook does not take kindly to the scientific names which are so necessary for the orientation of a technical zoologist, and any form that is worthy of recognition deserves some vernacular English name. The reviewer, however, does not believe in applying an old name to a new form which it does not fit, such as mountain lemming mouse to a form of the genus *Phenacomys* which is not very closely related to the mice and is still farther from the lemmings, and is moreover not known at all to the general public. *Phenacomys* will do for a name as well as *Hippopotamus* and *Rhinoceros* which are lifted bodily into English from scientific nomenclature of Greek derivation. Where a species of a well-known group has no common name in actual use, and no appropriate adjectival or geographic term will apply, the common practice of honouring the names of the worthies of our science has much to recommend it. The authors' footnotes regarding these names, pique our curiosity, add human interest to the history of our science, and give much information to those who are not familiar with early natural history work. The early naturalists did an important work in the development of our country as well as in our favourite sciences and deserve to be remembered.

The present work gives a good account of the Mount Rainier region, the physiography, and communities of mammals, birds, and plants. The life zones of Mount Rainier National Park are the Transition Zone, Canadian Zone, Hudsonian Zone, and the Arctic-Alpine Zone. Different habitats and associations are found in each of

these life zones, and certain species are characteristic of them. Lists of the characteristic trees and other noticeable plants which mark the boundaries of these life zones are given, together with illustrative pictures of the scenery therein. The large-scale contour-map with life zones in colour, will be extremely useful in a region where altitudes bear such an important relation to the species found. The habitats characterized by extreme moisture are lake, lake-shore, stream, stream-border, and swamp; by moderate moisture, meadow forest, burn; by deficient moisture or of a rocky type, alpine ridge and pumice slope, rock slide, and glacier.

While the majority of the photographs are taken from living specimens, particularly of the birds and large mammals, the authors have made some very interesting photographs of small mammals posed in their natural habitat. The small mammals always present unusual difficulties to the photographer. Captive animals have no adequate background, and many wild species are almost impossible to photograph, being active, restless, and mostly nocturnal in habits. Good pictures *in situ* are extremely rare, and the few examples generally have unsatisfactory backgrounds.

As an almost invariable rule, certainly with the larger species, photographs of dead animals are stiff and unsatisfactory, showing little but anatomical proportions. The authors have arranged a series of posed pictures with great care, including various species of vole, jumping-mice, pocket gophers, moles, shrews, and the like, posed in their exact natural habitat. These show the animals in relation to their nests, holes, or natural surroundings, and give a remarkable artistic effect with scientific accuracy. The plates are especially commended to preparators of habitat groups of small mammals, the quality of which has lagged behind most types of other exhibits in all of our museums.

This book on Mount Rainier National Park makes a notable addition to the wild life literature of the United States, competently prepared by co-operation of the National Park Service, the U.S. Biological Survey, and the State of Washington, and well worthy of the traditions set by preceeding works on the animals of Yellowstone Park, Glacier Park, and Yosemite Park. With the great and rapidly growing number of vacation tourists to these great national playgrounds, come many people who are seriously interested in the wild life which is one of the greatest assets of the national parks, and they want to learn more about it. Others come who may have their interest aroused and become amateur naturalists

and conservationists if given opportunity to learn of the wealth of interesting material within the reach of the attentive eye and ear. Interesting books, prepared by reliable authorities, without earmarks of enthusiastic but ill-informed propaganda, and sold at a price which any tourist or student can afford, offer a great field for such educational work. The average eye has not been trained to know what it sees outside of the normal routine of life, and misses much of the joy and benefit of vacation in mountain and forest, while even the oldest and most experienced naturalist finds something new on every trip. Such books as these will always be welcome as aids in revealing things of interest which our unseeing eyes may overlook.

The great Canadian National Parks particularly Jasper Park, Rocky Mountain Park at Banff, and Waterton Lakes Park (just north of Glacier Park above-mentioned)—are visited every year by thousands of tourists, among whom are numerous nature-lovers who would welcome nature handbooks similar to the one under review. The "Mammals and Birds of Mount Rainier National Park," which may be procured from the Superintendent of Documents, Government Printing Office, Washington, D.C., at 85 cents per copy, is a bargain to all Canadian students interested in the fauna of our Western mountain regions, and particularly to ornithologists and mammalogists living in British Columbia, or who hope to go there some time.—R. M. ANDERSON.

GENERAL ORNITHOLOGY LABORATORY NOTEBOOK
for the recording of observations made in the field and studies made in the laboratory on the birds of Eastern North America. By A. A. Allen, Ph.D., Professor of Ornithology; L. A. Fuertes, A.B., Lecturer in Ornithology; M. D. Pirnie, B.S., Instructor in Ornithology; Cornell University, Ithaca, N.Y. Including: A study of the external parts of the bird used in classification. A study of feathers and feather arrangement. A study of the bird skeleton. Keys to the Orders and Families of N.A. birds, revised classification. Migration data for birds of Central New York. A roll book for recording all birds seen on trips afield. A key to the nests of birds of Eastern North America. 125 identification and life-history sheets for intensive studies of the birds of Eastern North America. Published by The Cumstock Publishing Company, of Ithaca, N.Y. Price \$4.00.

Planned for students in the Ornithological Course in Cornell University, the above title page gives a complete outline of the contents of this remarkable production but fails to offer any idea of the great practicability of method and

beauty of make-up that it presents. In librarian's parlance it is probably small quarto, pages actually $8 \times 10\frac{1}{2}$ inches, firm loose-leaf construction, of various papers each adapted to its particular use. The covers are a fine, flexible artificial leather, waterproof, substantial, agreeable to the eye and touch and amply over-size to protect the edges of a working laboratory note book. It makes a volume that will stand much hard usage but fine enough to awaken pride in appearance and to induce care in keeping it neat and presentable.

The plan of the work is such as to demand original field, laboratory and bibliographical research in well balanced proportion. Outlines of feather structure are given upon which it is required to name the parts. Forms of the bird are presented upon which the feather and plumage tracts are to be outlined and named. A bird skeleton is figured to which the names of the bones are to be supplied. One page is included for a complete and accurate description of a House Sparrow using the technical terms of the preceeding lessons and accurate colour nomenclature. A section of special quadrille ruling follows for the condensed record of field observations but the main part of the book is composed of the "identification and life history sheets", a double page being allotted to single definite species. On the left hand side are two clearly drawn base maps of North and South America for laying down summer and winter distributions and headings with blank spaces to be filled in for Name (of species) vernacular and scientific; Arrivals, spring and fall; Preferred habitat; Location (of nest); Measurements; Eggs; etc., covering a wide field of life history facts. The upper right hand corner of the right hand page is occupied by an outline drawing of the particular bird dealt with to be coloured from specimen or field observation with blank headings such as Size; Sex figured; Recognition Marks; Distinctive Habits and other points of value in identification in hand or in field. A large part of this page is blank for original remarks. The species so treated cover most of the more common birds to be met with around Ithaca, for which region the book is specially prepared. At the back are a number of pages with the species left blank which the student can dedicate to such other species as he may desire and upon which he may make such original drawings as his ability or enthusiasm permits.

For a practical plan of systematic ornithological study we have hitherto seen nothing nearly so good. The spaces to be filled are at once a reminder of gaps in knowledge and an inspiration

to fill them. They are examiners as well as directors of study and it is certain that no serious attempt can be made to complete such a book without acquiring far more than a dilletante knowledge of ornithology. After such a book has been even approximately filled it would form a bird-book unique in itself of great intrinsic and scientific value and be a pride to its maker. This volume is a standing answer to the oft-repeated question from the amateur:—"What shall I do?" The reply is,—spend four dollars for this note-book and obtain an object and method of work that will keep leisure from boredom for a life time and produce in the end results worth while.

We cannot dismiss this enticing volume, for we must admit that it is a constant temptation to us to drop everything else and pitch in with colour, pen and pencil ourselves, without a word or so on the drawings of our late friend, Louis A. Fuertes. Though just plain outlines, simplified so as to be little more than guides for applying colour, they are rich in birdy feeling and naturalness. They suggest that in these days of half-tone processes when all the world is running to cheap colour and wash reproduction, we might with advantage return in greater degree to an earlier simplicity and re-learn some of the charm of line work.—P.A.T.

A LIST OF NEW BRUNSWICK BIRDS prepared by
Wm. H. Moore, Scotch Lake, N.B. Prepared
under the auspices of the Fredericton Science
Club, March, 1928.

This is presented as a complete schedule in 44 pages of the birds of New Brunswick, Canada. The A.O.U. number is given, both scientific and vernacular names and the numerical status in the province in abbreviations. Symbols are used to show the species included in early lists of A. L. Adams in 1873 and M. Chamberlain in 1882. Other sources of information are given in a paragraph of acknowledgments to individuals and a list of eleven titles of publications. Some of these titles we have not seen before. Some species are very briefly annotated and frequently the name of the reporter is given.

Though it is an ungracious and unpleasant task to criticise adversely earnest endeavour and good intention, the more so when we have a particularly friendly leaning towards the author, it is one of the duties of a journal such as *The Naturalist* to uphold within its field standards of work that will command the respect of the scientific world. That this list has failed in this respect is regrettable and we would be remiss in our duty did we not point out some of its vital

shortcomings as a caution to future authors and so that students unfamiliar with the field may not take this list too seriously.

That the brochure is produced under the formal sanction of a learned society makes this course the more necessary.

The field of published information has been very briefly gleaned, many important modern works have been disregarded and no periodical literature at all has been consulted. Distribution within the province has not been attempted and localities of occurrence, dates, and details have been almost ignored. Little or no discrimination has been shown in acceptance or rejection of records and the possible, impossible or probable are all presented on the same footing. We note old records that we had hoped were long decently buried and forgotten given a new lease of life. As example, Audubon's discredited record of the Large-billed Puffin and Chamberlin's certain mistake of the Crested Puffin are included. A record of the Florida Cormorant is quoted without authority for identity or comment and with as much assurance as those of the Common or Double-crested. That the author is unfamiliar with current taxonomic concepts is evident by his consistent misuse of the word species when subspecies is demanded. All through the list we find records that awaken interest without satisfying doubt or furnishing pertinent details. Undoubtedly many of these records are good as far as they go but there is no way of distinguishing between the wheat and chaff and the reader is in the unenviable position of realizing that he is neglecting interesting and important things through the doubt raised by a few obvious errors.

In dismissing summarily some of the older records we do not wish to appear to be casting undue discredit upon the elder authorities. There were good bird men then as there are to-day, but their opportunities were few and American ornithology was young. It is doubtful if under similar conditions we could do better. Such a list as this might well have been of service to science fifty years ago but that day has passed. Beginning where our honoured predecessors left off instead of at the beginning as they did, it would be strange indeed if we had not advanced in critical discrimination and refinement of method. Perhaps ornithologists of the future will regard our work as crude, as we do that of the past generations. We do not pretend to know it all even yet and there are many questions that we are making tentative decision upon simply because a temporary working hypothesis is necessary but with the disquieting feeling that perhaps we are all wrong and future generations will

smile patronizingly upon us. But we of the twentieth century must work with twentieth century methods and go forward with our standards, not backward.—P.A.T.

PRAIRIE BIRDS by B. J. Hales. Pp. 334+xiv with 4 coloured plates and numerous figures. Toronto: The Macmillan Co. of Canada. Price \$2.75.

This book adds yet another to an already long list of bird books written primarily for the use of amateurs. We learn from the preface that teachers have also been considered. Here also we read: "It will be found perhaps, quite as valuable for what it omits as what it includes; as much confusion arises from using books containing species not found in the range." How successful the volume will be in achieving the task it has set itself is, perhaps, open to question but it is a question applicable to many another book with similar aims.

The general plan of the work is the usual one. The length of each species is first given, followed by a brief description. Breeding habits are next summarised and compressed into a couple of lines, while season and range complete the systematic sections. Then come paragraphs, varying in length and number, of general comment on the occurrence and habits of the respective types. Some of these, as for instance those under Bittern and Ruffed Grouse, make exceptionally good and entertaining reading. Others are quite slight and contain but little information. Various species are not accorded this treatment at all and we find here and there lists of "Additional Rarer Species" each of which is dismissed with a line or two. Moreover, some 10 common migratory and breeding birds are entirely omitted. Some of these, such as the American Pipit and many of the sandpipers migrate across the entire prairies in countless thousands. In point of omission the waders are the heaviest sufferers, only 20 out of a total of nearly 40 being listed. One of the omissions, the Piping Plover, is a regular breeder on the southern prairies, particularly in Manitoba.

The author includes as prairie species many that have been recorded but once or twice and that can at best be considered accidentals. This should doubtless be so in a complete treatise on prairie birds but in that case at least 20 additional stragglers should be added. Some of them, such as the White Gyrfalcon and Hudsonian Curlew are possibly sufficiently frequent to be considered as irregular rather than accidental.

The inclusion of birds like Richardson's, Franklin's and the Spruce Grouse on a prairie list

should be accompanied by an explanation. If these species have ever strayed onto the prairie proper the evidence would, no doubt, be widely appreciated.

Superficial keys are provided for the different groups in approved fashion but exactly what value they may have seems doubtful. Their principle does not appeal to the present writer but that is merely personal opinion. The examples under consideration resemble most others. A casual survey does not heighten one's faith in them. "Bill narrow with teeth showing along the edge" (Mergansers, p. 25) is hardly a justifiable remark. There are many amateurs innocent enough to believe it. Since the solitary but conspicuous spot on the breast of the Tree Sparrow is its "hall mark," "breast not streaky or spotted" (p. 222) does not seem particularly helpful.

Distributions are in the main satisfactory, although Alberta is in many cases excluded where it should be included. But it is a pity that so many historic myths have been retained as, for example, the breeding of the Least Sandpiper on the prairies, the nesting of Bonaparte's Gull on the ground, or the Buffle-head in holes in banks or that the Great Grey Owl does not breed south of Great Bear Lake.

In common with many other writers our author repeats the usual formulæ for recognising birds in the field without adding anything that is original or more to the point. This is a pity, for the opportunities of improving on what has gone before are almost unlimited. The following examples will serve as illustrations. "The Golden Plover so much resembles the Black-bellied that the two are hard to distinguish, if the specimens are not in hand" (p. 100). As a matter of fact, the former, with its pale axillaries and dark tail can be told in all plumages from the latter with its black axillaries and white tail as far away as they can be seen. No shore birds are more easily told apart. In the case of the Ring-necked Duck (p. 49) its supposed similarity to the Scaups is duly dwelt on. The dark back of the Ring-neck and the absence of a white speculum which distinguish it so completely that anyone familiar with it cannot imagine how confusion with the Scaups ever arose, are not pointed out: nor is the ring round the neck of the Lesser Scaup in certain plumages referred to and yet this may be far more conspicuous than that of any Ring-neck. The account given can only perpetuate the needless confusion between two easily separable species. In accordance with hallowed tradition, attention is called to the number of "notched" primaries on the wing of Redtail and Swainson

hawks (p. 131). But all hawks have emerginated primaries and unless that fact is not only mentioning but stressed, endless mistakes must spring from this standard specification. The present writer on one occasion found it impossible to persuade two experienced western ornithologists—not amateurs—that an American Roughleg was not a Redtail for they had counted the "notches" and found them to number four. There are innumerable instances of this sort of thing in the book. One cannot imagine anyone familiar with the birds in life likening the Hudsonian Godwit with its great white rump to the Marbled (p. 91) or talking of the distinctively marked Willet thus—"Its markings are somewhat uncertain and more or less variable" (p. 94). This feature of the book is particularly regrettable because it in no way helps to dissipate the doubts that bewilder the average amateur.

Seldom does our author describe the calls or songs of birds accurately and yet this is frequently the soundest means of telling closely allied forms. Where the Savannah and Baird Sparrows, for instance, breed together as they do on large tracts of the southern prairies, their characteristic songs distinguish them on the spot. This is but one of many similar cases. (Incidentally, the Baird is only casually mentioned [p. 239] and classed with Leconte's and Nelson's Sparrows. It is, as a matter of fact, quite different from either in song, habits and distribution).

The treatment of subspecies is very variable. In the majority of cases no reference is made to races at all. In some of the exceptions the handling is not very happy and *sub-species* are frequently referred to as *species*, e.g. Richardson's Merlin, p. 142. In this case the author seems to be confused in several other respects as well. In the systematic paragraph he attributes the blue plumage of the male Pigeon Hawk to the breeding season only, while his description of Richardson's Pigeon Hawk is entirely wrong in all respects.

The book is unfortunately full of minor errors which, together with the large number of omissions (about 17% of known prairie species) leaves the reader with the impression that the author's experience is too circumscribed to make his large undertaking a convincing success. On reading such portions as those of the Bittern and Ruffed Grouse, engagingly written and suggesting intimate first-hand knowledge, one's mind wanders back to such old classics as Boothe's "Rough Notes" and one wishes that more modern authors would ignore the ruts of convention, leave systematic treatment alone and produce works, if

not as ambitious in scope, at least of specific value to both amateur and advanced student.—W.R.

LIFE HISTORIES OF NORTH AMERICAN SHORE BIRDS. *Smithsonian Institution. United States National Museum Bulletin 142. Order Limicolæ (Part I). By Arthur Cleveland Bent of Taunton, Massachusetts. Washington. Government Printing Office, 1927.*

This is the seventh volume of the series of publications by Mr. Bent on the life histories

of North American birds. It contains admirable detailed accounts of the ways of life of our shore birds, from the Phalaropes to the Lesser Yellow-legs, following the general plan that was used in the previous volumes of the series and that has already been described in *The Naturalist*. Most shore birds have a northern breeding range, and so it comes about that a great many of the birds considered in this volume nest in Canada.

Every Canadian ornithologist and bird student should possess a copy of this valuable work.—HARRISON F. LEWIS.

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A NEW CEPHALOPOD FROM THE TRENTON LIMESTONE OF MONTREAL

By T. H. CLARK



ONE OF THE most remarkable fossils recently acquired by the Peter Redpath Museum is a large specimen of a straight shelled cephalopod. Cephalopod fossils are relatively rare in the vicinity of Montreal, so that almost any collectable specimen is likely to be of considerable interest and possibly of great value. Such is the case with the one in question, for not only is it the largest cephalopod recovered from the strata of the Ordovician Period hereabouts, but it belongs to a species hitherto unknown. The Museum is indebted to the courtesy of Mr. J. A. Nadeau of Outremont, who reported to us the discovery of the fossil as it lay exposed on the surface of a ledge of Trenton limestone along the banks of the Back River (Riviere des Prairies) at St. Vincent de Paul. To Mr. Judah of McGill University our thanks are due for assistance in the actual work of separating the fossil from the ledge, a task of no mean consequence for the limestone was so tough and so traversed by joints that, while being extracted, the specimen was unavoidably broken into a score of pieces which had to be carefully joined together again in the laboratory.

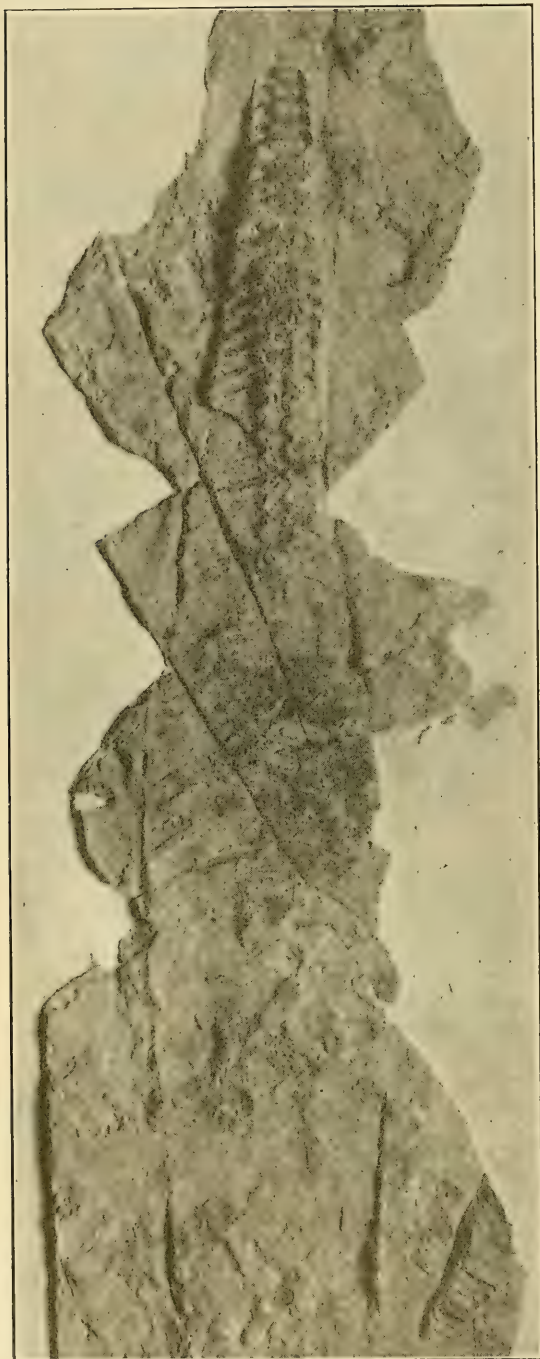
Trenton rocks of the vicinity of Montreal and Ottawa abound locally with fossils, all of which are remains of the invertebrate type of animals or obscure traces of seaweeds. At that remote period, whose antiquity is estimated to be of the order of four hundred million years (the figures obtained by a study of the radioactive minerals in the rocks), primitive vertebrate animals, probably shark-like, were certainly in existence, but their presence would not have been likely to leave a record behind in the form of fossils because of their probable scarcity and their lack of preservable parts. It was not until the second succeeding period that fish fossils become at all important for which reason that period, the Devonian, has been given the name of the "Age of Fishes". During those ancient times fish were certainly the dominant creatures in the sea, but during the Ordovician this dominance was in all probability assumed by the cephalopods. Modern cephalopods, such as the cuttle-fish, devil-fish, and

octopus are considered the most cunning and powerful of modern marine invertebrates, and their progenitors in Ordovician times could scarcely have been less proficient. These latter were all shelled, the shells being coiled like that of the modern Nautilus, or curved, or perfectly straight. One characteristic pervades all these shells, however, and that is that the animal constantly outgrows that part of the shell in which it lives and accommodation to this increased size is achieved by building out the enlarging shell, but unlike the snail these animals inhabit only the larger end of the conch, shutting off all of the smaller part by a partition, successive partitions being built as the animal advances. It was this habit which inspired the words written by O. W. Holmes in his poem entitled *The Pearly Nautilus*:

"Build thee more stately mansions, O
my soul."

The chambers left behind by the growing animal and barricaded by the successive partitions are filled with gas, and serve as hydrostatic organs. The animal, by varying the gas pressure within them can rise or sink at will without further muscular effort. The Nautilus is to-day the only surviving example of the shelled cephalopods, the race which once held the whip hand over all denizens of the sea, to lose it eventually to the more agile and progressive fishes.

A glance at the conditions where the muds and other sediments which were eventually to form the Trenton limestone of eastern Canada were accumulating would have shown a fairly shallow sea, well lighted at all times, whose floor was seldom below the limit of wave agitation, but rarely exposed to the air. For example, in many of the quarries in Montreal acres of this limestone may be seen to bear a type of ripple mark which is only made in very shallow water; moreover, rather infrequently, mud-cracked layers of limestone betray the occasional emergence of the sea floor so that its wet muds could be dried out and cracked by the heat of the sun. In this situation, life of the invertebrate type abounded



The type specimen of *Actinoceras imperator* sp. nov. $\times \frac{1}{4}$

and the rocks reveal fossils of sponges, corals, crinoids, bryozoa, brachiopods, gastropods, pelecypods, cephalopods, and trilobites in greater or less abundance. Of all of these the cephalopods

were the only ones provided with active organs of offence. A pair of parrot-like beaks coupled with a motility denied most of the other groups rendered them practically immune to the attacks of animals other than their own kind. We picture them browsing about on the sea floor, consuming algæ, perhaps crushing and devouring contemporaneous shell-fish, while the spires of the straight shelled forms pointing upwards from the sea floor would, in shallow water, have projected above the surface with the appearance, in miniature, of the spar buoys seen in our modern harbours. To such belonged our new specimen, whose description follows.

Actinoceras imperator sp. nov.

The conch is large, 66.1 cm. long as preserved, probably 74.2cm. long when complete. Hereafter all measurements are made from the restored apex. The enlargement is rapid for about two thirds of the entire length, uniformly 1 in 3.6 for the first 44cm., when a width of 12.5cm is attained, after which the increase is slight for 5.8cm. to the maximum thickness, 13.1cm., and from that point forwards there is an even diminution in the diameter so that at the distal end the aperture measures 9.2cm. across. The septa are numerous, 44 can be counted. In the expanding part and just beyond the greatest diameter of the cone 34 camerae occupy a length of 38.8cm., an average length of 1.14cm.; these camerae vary in size, becoming progressively longer toward the distal end of the shell, the proximal camerae being 1cm. long and the distal ones under consideration being 1.2cm. long. The last eight camerae are unequal in length, totalling 3.7cm. and averaging 4.6mm. The ultimate septum is much thickened, at one place being nearly 2 mm. thick. The siphuncle is nummuloidal, and 12cm. from the apical end of the specimen occupies $\frac{19}{32}$ of the width of the conch; its greatest width obtains 21.4cm. from the apex where it is $\frac{32}{49}$ of the width of the conch. Thence it narrows, and its last observed expression is 1.4mm. wide, 35cm. from the apex, or $\frac{14}{104}$ the diameter of the shell. The distal 18 camerae show no trace of siphuncular structure at all. The segments of the siphuncle occupy about two-thirds the length of the camerae, and their septal necks about one-third at the proximal end. Toward the middle of the conch the relative length of the septal neck decreases until a condition approximating but not reaching that in *Armenoceras** is reached. The siphuncle is eccentric, its axis follows a line

*Foerste, A. W., *Silurian Cephalopods of Northern Michigan*. Cont. Mus. Geol., Univ. Mich., Vol. 2, No. 3, p. 32. 1924.

about one-third the diameter from the margin. No information regarding the shape of the cross-section of the shell can be gathered from the specimen, except that at the few places where the external curvature is exposed no sign of flattening can be seen. The type specimen, herewith illustrated, is in the Peter Redpath Museum, McGill University.

This specimen is particularly remarkable because of the association of gerontic features. First, the siphuncle contracts anteriorly; secondly, the last nine septa are closely crowded together, indicative of an inability to move forward the accustomed amount; and lastly, the contracting of the conch towards the aperture and the thickening of its distal part. This is rather an unusual feature, for the contraction is ordinarily restricted to the living chamber alone, and is frequently effected by an internal thickening of the wall of the living chamber, the exterior showing no decrease in diameter. Our specimen not only shows such a decrease, but also a deposit round the interior of the distal end of the living chamber

thickening the outer rim so that 2cm. from the edge it is 8mm. thick.

A. anticostiense (Billings), from the Richmond and Gamache of Anticosti, is fully as large as our specimen, but its ventral side is known to be strongly flattened and on that side the sutures are strongly recurved, whereas on the broadly convex dorsal side they are directly transverse. The thickness of the siphuncle in a dorso-ventral direction exceeds one-half the diameter of the conch, laterally it slightly exceeds one third. The septal necks are much longer than in our specimen. *A. (Armenoceras) sedgwicki* (Billings), from the Richmond and Gamache of Anticosti, is generically distinct from our specimen because of the lack of a septal neck, the segments of the siphuncle are adnate to the enclosing septa. *A. (Leurorthoceras) beloitense* (Whitfield), from the Black River of Wisconsin, Lake Huron, and Arctic America, is also generically distinct by being flattened ventrally with broad ventral lobes to the suture, and the siphuncular segments are only moderately inflated. Few other cephalopods of commensurate size and of the *Actinoceras* type are known.

THE FLUCTUATION IN THE POPULATION OF WILD MAMMALS, AND THE RELATIONSHIP OF THIS FLUCTUATION TO CONSERVATION

By R. M. ANDERSON

Chief of Division of Biology, National Museum of Canada

Read at Provincial-Dominion Game Conference, held at Ottawa, January 26, 1928.

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WHILE in a general way it is a matter of common knowledge among farmers, trappers, fur-dealers, and naturalists, that there are wide fluctuations in the numbers of various species of wild mammals from time to time, the extent of such variation and its periodicity are not so well understood. The mammals, being as a rule comparatively stationary in their habitats, or only slightly or imperfectly migratory, and distributed in some cases over immense areas, do not lend themselves readily to the methods of census-taking like the migratory wildfowl which congregate in masses on restricted areas in winter or on summer breeding grounds.

Statistics based on fur returns are apt to lead to misleading conclusions unless spread over a wide area for a term of years. While sudden rises in prices may temporarily lead to intensive

production, or rather exploitation, in certain areas, swelling the statistical figures, this may lead to depression later, since the law of diminishing returns rapidly gets in its deadly work in the fur-trade. Regardless of commercial reasons, however, there is a normal and fairly periodic fluctuation in the numbers of certain species due to natural causes.

The records of the Hudson's Bay Company's fur returns for the past hundred years are particularly suitable for data on these fluctuations, as the Company was not accustomed to stimulate the production of any particular kind of fur, but took the whole fur produce in trade from the natives and sold all the furs at annual fur-sales in London, without holding fur from year to year for speculative purposes.

Records were also kept showing the periodic increase and decrease of other forms of wild

life, as these keenly affected the life of the Indians and other inhabitants of the North, directly affecting the output of furs and the amount of provisions and other credit supplied to the natives. In many districts the Indians starved during bad rabbit years, and were consequently unable to travel and trap during the fur season, while carnivorous mammals which fed on the rabbits diminished in proportion to the rabbits.

Dr. C. Gordon Hewitt¹ quotes the periods of maximum abundance of the snowshoe rabbit or varying hare, (*Lepus americanus*) according to the Hudson's Bay Company's returns: 1845, 1854, 1857, 1865, 1877, 1888, 1897, 1905; or in other words in cycles of 9, 3, 8, 12, 11, 9, and 8, giving an average periodic cycle of 8.5 years, which is not far from the popular belief in a seven-year cycle for this animal. For the lynx the average periodic cycle of 9.5 years is given, the lynx becoming more abundant from the year of rabbit abundance to three and four years later. Foxes show a periodic cycle of about 9.5 years, marten of 9.5 years, fisher and mink of 9.7 years each. Wolves and muskrats, which have a wider range of food supply, show slight and irregular periodic fluctuations in numbers.

The ultimate causes of the fluctuations of these fur-bearers are in many cases obscure or unknown. Some of the rodents, as mice, voles, lemmings, and rabbits, are very prolific, and when favoured by a combination of friendly circumstances, such as good climatic conditions, abundant food, and security from natural enemies, increase prodigiously until overcrowding brings in epidemic disease which reduces the numbers to a minimum. Vernon Bailey² has shown by experiments that a female meadow mouse can produce seventeen consecutive litters of young in captivity within a year, while one specimen, born on May 25, produced 33 families of young, totalling 78 in number, before she was a year old.

Many of the predatory mammals, as fox, lynx, and marten, subsist largely upon these smaller mammals, and the abundance of the carnivores depends more or less closely upon the presence of their favourite prey. Mammals which feed upon a mixed diet of insects, fish, and vegetable

matter, do not show such extremes of variation in numbers. Whether the decrease in numbers of the predatory mammals is due to actual starvation, whether scarcity of food affects their fertility, and whether over-feeding in time of abundance has an adverse effect on reproduction are problems which have not been sufficiently studied.

Occasionally, when a disease from wild mammals, or carried by wild mammals, affects live stock or human beings, such as anthrax or Texas fever, interest is stirred up and investigations made. One of the latest cases of this nature was first noted in 1919, when the United States Public Health Service started an investigation of the so-called "deer-fly fever." They found the germ carried by the deer-fly to wild rabbits, proved that it could be carried from one rabbit to another by rabbit-lice, that an infected bedbug could give the infection to a mouse, and that a mouse could catch the disease by eating an infected bedbug. Frequent cases were found where market-men got so-called "rabbit fever" from handling dead rabbits, particularly rabbits from certain states, and others were infected by bites from ticks which feed on jackrabbits and snowshoe rabbits. Some cases were serious, a few fatal. Ultimately it was found that the trouble was caused by the same microbe found in 1911 in ground squirrels in Tulare County, California, and named *Bacterium tularense* McCoy. The name tularemia for the new disease, is derived from this.³

While decreases in the number of rabbits are immediately obvious in their effects, both upon human inhabitants and upon the larger carnivores, other influences may be at work which are not so readily detected. Other small mammals, apparently insignificant from the human standpoint, may have far-reaching influence upon the rest of the animal kingdom. Cabot has shown the importance of the native mice to the land mammals and birds of Labrador.⁴ In periods of scarcity of small mammals the food supply of the carnivores is directly affected and in periods of extreme abundance of the former the vegetative growth may be adversely affected to the detriment of other forms of life. We have seen this in various historical mouse plagues which have grievously affected agricultural interests. We also see that when animals, such as ground squirrels ("gophers"), or wolves and

¹ *The Conservation of the Wild Life of Canada*, Chapter IX, pp. 213-234, Charts I to V, Charles Scribner's Sons, New York, 1921.

Since writing the above, Mr. C. S. Elton, of Oxford University Museum, has called my attention to the fact that more recent revisions of this data, by a more scientific analysis of the peak figures, have shown that the periodic cycles of both rabbit and lynx average about 10 years. Muskrats are also shown to have a periodic cycle of about 10 years. See also Elton, C. S., "Periodic Fluctuations in the Numbers of Animals: Their Causes and Effects," *Brit. Journ. Exper. Biol.*, II, Oct., 1924, pp. 119-163.

² "Breeding, Feeding, and Other Life Habits of Meadow Mice (*Microtus*)", *Journal of Agriculture Research*, Vol. xxvii, No. 8, Feb. 23, 1924, p. 528.

³ de Kruijff, Dr. Paul, "When You Shoot a Rabbit, look out for Tularemia, a mysterious plague—It's easy to avoid," *The Country Gentleman*, Vol. xcii, No. 10, October, 1927, Philadelphia, pp. 13-15, and 43.

⁴ Cabot, William B., In Northern Labrador, Boston, 1912, appendix, pp. 287-292.

coyotes, become a menace to agricultural or stock-raising interests, that something is very soon done about it, and investigations are instituted. The same could be done in regard to the game and fur-bearing mammals.

There are still deeper problems involved, which, unfortunately, have not received the attention they deserve. Pathologists have devoted most of their time to the study of diseases which affect mankind directly, and have discovered the relation of the yellow-fever and malarial mosquitoes, the hookworm, certain of the trypanosomes to sleeping sickness and other tropical diseases, and the rat and ground squirrel to other diseases, but the surface has only been touched. We have found that certain species of tape-worms have an injurious effect on the health of domestic and wild animals, but few of their life histories have been thoroughly worked out. Only last fall, Dr. Seymour Hadwen, my companion on a field trip, found numerous cysts of a probably unknown species of tapeworm in the liver of a wild muskrat in northern Alberta, but its secondary host is unknown, and we do not know to what extent this may affect muskrat life. The most lowly species of vole or shrew may be host to various internal and external parasites, or bear trypanosomes in their blood which may work


havoc on themselves and on other species which eat them raw or feed on their range.

The problems of wild animal life are so varied and interlocking that the services and co-operative studies of zoologists, parasitologists, pathologists, and veterinarians, extending over a period of years, are essential to the beginning of a thorough elucidation of the questions involved. We have only made the barest beginnings in scientific study of most of these questions.

It is evident that over-hunting and trapping during periods of natural depression may be disastrous to the continuance of many species, particularly of such species as have a virtual bounty on their heads in the form of spectacular prices for furs. When we have more definite knowledge of the causes involved we may be able to do something towards alleviating or preventing some of the unfortunate results, and in the meantime, our game officials may be able to obtain data on the periods of low ebb of species, and make provision in time for special protection of such species at the initiation of such periods of depression, by legislation providing for temporary closed seasons without the necessity of special legislation covering each suspension of the open season, a method which is usually too slow to be effective in such cases.

NOTES ON BIRDS OF THE LABRADOR PENINSULA IN 1928

By HARRISON F. LEWIS

N THIS YEAR the time that I spent on bird protection duties on the south shore of the Labrador Peninsula, between Shelter Bay and Blanc Sablon, extended from May 4 to September 14. From the observations of birds made during that period the following have been selected as suitable to offer for publication here.

1. *Allè alle*. DOVEKIE.—Dr. Arthur A. Allen and I saw two in spring plumage together in the middle of outer Coacocho Bay on June 9.

2. *Larus kumlieni*. KUMLIEN'S GULL.—An adult of this species alighted on the water close beside the S.S. *Nayarit*, on which I was a passenger, while it was under way near Bay Johan Beetz on May 12. I identified it by careful observation, through X6 binoculars, of its characteristic markings.

3. *Sterna caspia imperator*. COUE'S CASPIAN TERN.—Audubon found this species, which he mistook for the Royal Tern, nesting near Little Mecattina Island, but of recent years it has

been found nesting along the north shore of the Gulf of St. Lawrence only on Fog Island, about twenty miles west of Cape Whittle. However on July 23, when I visited a colony of Ring-billed Gulls (*Larus delawarensis*), in Mecattina Bird Sanctuary, about twelve miles east of Little Mecattina, I was greatly pleased to hear, amid the clamor of the Gulls, the harsh note of the Caspian Tern. One individual was soon seen, hovering among the Gulls, but no other Caspian Tern was observed at this place. As I was about to leave the colony I noticed one nest, a little apart from the others, which contained three eggs, two of which seemed to be typical eggs of the Ring-billed Gull, while the third was much more elongated and was apparently an egg of the Caspian Tern. This longer egg, when handled, was observed to be addled. I could not help wondering if I was observing, in what seemed to be an unmated bird and its infertile egg, the last descendant of the Caspian Tern reported here by Audubon.

The colony of Caspian Terns on Fog Island is thriving and contained nearly or quite fifty occupied nests in 1928.

4. *Phalacrocorax carbo*. COMMON CORMORANT.—The colony of this species on the cliffs of Lake Island, near Cape Whittle, is making excellent progress. When visited on June 13 it was found to contain at least 48 occupied nests, as compared with only 32 observed in 1927. One wholly new group of 12 nests was established this year, some distance west of the still occupied nesting-places of recent years.

5. *Nettion carolinense*.—GREEN-WINGED TEAL.—On an island at The Bluff Harbor, about twenty miles west of Cape Whittle, I flushed a female Green-winged Teal from her nest on June 21. The nest was on top of a small, low knoll in a slight hollow in a treeless area, and was in the midst of a moderately dense growth of Labrador tea, which both surrounded it and covered it in loosely above. It contained nine eggs and very little down. A male Green-winged Teal was flushed from a small pond close by.

6. *Charitonetta albeola*. BUFFLEHEAD.—On June 9, 1928, Mr. Angus Milne, agent in charge of the Hudson's Bay Company's post at Romaine showed me a mounted specimen of an adult male Bufflehead which had been given in the flesh to him by an Indian, who said that he had found it dead somewhere along the Coacocho River late in the autumn of 1927. All the Indians about Romaine said that they had never before seen a bird like it.

7. *Somateria mollissima dresseri*. AMERICAN EIDER.—As a result of a very fine, warm month of May, the nesting Eiders of this region began to incubate earlier than usual. The weather in June was good, and the number of young Eider Ducks hatched along this coast during that month was astonishingly large—undoubtedly the largest hatch of any of the eight years of my experience here.

Unfortunately the schools of the small bait-fish known as the capelin were late in arriving and were smaller than usual this year, and thus the food supply of the Great Black-backed Gulls (*Larus marinus*) was unusually restricted in June, when their young were hatching and requiring food. Because of this, the Great Black-backed Gulls, which each year destroy some young Eider Ducks, destroyed in 1928 far more of them than usual. For them, the scarcity of capelin was balanced, in part at least, by the unusual abundance of young Eiders. Although a great many young Eiders escaped and grew to maturity, I think that Great Black-backed Gulls destroyed

in this region this year at least three-fourths of the number that hatched.

At Wolf Bay this year a young Eider Duck was found in the stomach of a sculpin (*Mykoxcephalus groenlandicus* (Cuv. & Val.)), an omnivorous bottom-feeding fish.

8. *Botaurus lentiginosus*. BITTERN.—As I approached the falls of the Blanc Sablon River from the east side, on July 11, a Bittern flew down stream, passing low and clumsily, between me and the falls. I had an excellent view of it, but did not use my binoculars. It uttered three or four croaks or squawks and alighted in a grassy, marshy tract a little distance farther down the stream.

9. *Tringa solitarius solitarius*. SOLITARY SANDPIPER.—At Natashquan I obtained very satisfactory observations of one on August 17 and of one—perhaps the same bird—on August 18.

10. *Charadrius melodus*. PIPING PLOVER.—When in company with Mr. C. H. Watson, of Andover, New York, on June 27, I saw a Piping Plover on the sand beach between Natashquan village and the mouth of the Natashquan River. I observed it carefully through X6 binoculars at a distance of about 30 feet and saw clearly the characteristic colour and markings and heard the characteristic low note. I have had previous field experience with this species and am well acquainted with the Semipalmated Plover.

11. *Lagopus lagopus lagopus*. WILLOW PTARMIGAN.—Residents of the coast reported that this species, which is usually common and often abundant along this shore in early winter, was almost entirely absent during the winter of 1927-28.

Nevertheless birds of this species occurred and bred in the summer of 1928 on the large island at The Bluff Harbor where they had nested every year since 1925. It seems probable that two pairs of Willow Ptarmigan nested on this island in 1928.

On June 21, 1928, after protracted searching in the early morning, Dr. Arthur A. Allen and I observed two cock Willow Ptarmigan on this island. They flew at one another and battled briefly, crowing at intervals. Thereafter we lost sight of one, but followed the other one about for nearly two hours. Dr. Allen saw it eating parts of dwarf birches.

The crow or cackle of the cock was uttered at the end of a flight, which was either long or short. Just before alighting the bird made a short upward swoop, then threw itself into a position in which the head was well up, the body

being tilted up at an angle of about forty-five degrees to the horizontal with the wings outspread and stiffly arched; immediately following which antic, the bird said, as it sailed lightly to the ground, *Cah-ca-ca-ca-ca-ca-ca-ca-ca-ca-Cah!* The noise sounded as though it were made by releasing a spring.

The two cock Ptarmigan seen on June 21 had the head, neck, and breast rich chestnut, and the belly white, and had much white in wings and tail, but showed also a good deal of dark feathering intermingled with the white on the back and the upper proximal part of the wings.

As I was walking over this same island about forty minutes before sunset on June 29, a cock Willow Ptarmigan suddenly jumped up from a low, sparse growth of sweet gale about fifteen feet from me and, instead of flying, began to run rapidly away, with trailing wings. I approached the spot from which he had sprung and saw there the hen Ptarmigan and twelve small downy chicks. From above the hen appeared chiefly buffy and black, but showed some white in the wings and had a slight red comb on each side of the head above the eye. The chicks were rather slim and "rangy", and were yellowish, with darker longitudinal bands above. They peeped continually as they scattered in confusion but soon they disappeared as though they had sunk into the earth. Meanwhile the hen and the cock circled silently above me, on the ground, holding their bodies low and trailing their wings. The hen circled about three feet from my feet, the cock about twice as far away. I soon walked briskly on, and the birds then accompanied me, advancing on my right and on a course nearly parallel to mine, but gradually diverging from it. They accompanied me thus for about fifty yards. Just before they left me the cock said, *Kwakh-ow*, which was the only note that I heard from the adult birds in the entire course of this encounter.

About twenty minutes later I returned by a different route and started up both adult birds close together, not far from where I found them the first time. This time they both ran on ahead of me, on somewhat divergent lines, and at a rate of progress that was faster than mine. The cock ran faster than the hen and at a distance, about fifty yards from me, stopped and said, *Cah-ca-ca-ca-ca-ca-ca-ca-ca-ca-Kwakh-ow, Kwakh-ow*. I had to hurry on and soon lost sight of the Ptarmigan. The young were not seen during this last encounter.

12. *Nyctea nyctea*. SNOWY OWL.—On the island at The Bluff Harbor on which the Ptarmigan nested a Snowy Owl with fairly heavily barred

plumage was observed for some time on August 10.

13. *Corvus corax principalis*. NORTHERN RAVEN.—As I passed, shortly after sun-down on July 12, along the road that runs beneath the cliffy head of Barque Point, on the eastern side of Bradore Bay, a Raven perched on the summit of the cliff croaked the alarm and immediately Ravens in some numbers flew up from below the cliff and hastily dispersed. I counted them as well as I could in the gathering dusk and think there were at least 42 of them. Apparently they were assembled at that place to spend the night.

14. *Quiscalus quiscula aeneus*. BRONZED GRACKLE.—A flock of at least eight Bronzed Grackles was seen in open woods at Betchewun on June 3.

At Natashquan one was seen on June 7 and one on August 18.

15. *Zonotrichia leucophrys leucophrys*. WHITE-CROWNED SPARROW.—One was very clearly seen, at a distance of ten feet, at Havre St. Pierre on May 9. This is an unusually early date for this species to be present on this coast.

16. *Hirundo erythrogastra*. BARN SWALLOW.—One was observed near the mouth of the Little Watshishu River on June 6.

17. *Oporornis philadelphia*. MOURNING WARBLER.—On June 21, about 6.00 p.m., I stood in a restricted patch of waist-high fir and spruce on a large island at The Bluff Harbor and made "squeaking" noises in an attempt to excite a Short-eared Owl. Suddenly I saw a Warbler appear above the top of the scrubby growth about fifteen feet in front of me. It had come up through the branches from below. The sun was behind me and shining strongly, and so the bird's colours showed very plainly. It had grayish head, neck and upper breast, no white eye-ring, black lower breast, olive-greenish back and wings, and yellow belly, and was at once recognized by me as an adult male Mourning Warbler. This is a species that I have known well for many years.

The Warbler was entirely silent and, after a brief glance at me, it dropped down below the surface of the scrub again. I tried to get it to appear once more, but shortly afterward I saw it dart silently out at one side of the patch of stunted trees and fly quickly away from me to another similar patch not far distant, where I was unable to find it again.

This appears to be the first record of the Mourning Warbler in the Labrador Peninsula.

18. *Oenanthe oenanthe leucorhoa*. GREENLAND WHEATEAR.—On the afternoon of May 14, as I approached Natashquan wharf by the road,

a small bird flew up from the ground and swiftly away to my left, following the curve of the hill closely, and so quickly vanishing from sight. I caught a glimpse of gray and white and, thinking that the bird might be a Wheatear, I soon went in pursuit. However, I did not succeed in finding it again at that time.

About 7.00 o'clock on the morning of May 15, when I approached the same place in the same way, a bird suddenly attracted my attention by jerking its body sharply and crying *Chack!* in the same place on the gravel of the road where the bird was found the day before. A moment later it flew farther up on the hillside. I followed it and soon assured myself that it was a Greenland Wheatear. I was able to follow it about and examine it carefully through X6 binoculars in good light on the open hillside and road for about twenty minutes, after which I had to leave it, in order to attend to other things.

Its bill was black and slender, about half an inch long. From its base on each side a black mark extended backward, widening a little on the side of the head, where it terminated. The forehead was narrowly white, the top of the head and the back were a beautiful light gray, almost a bluish gray. The wings and the outer end of the tail were black or blackish, but the basal part of the tail, the under tail-coverts, and apparently some or all of the upper tail-coverts were white. The underparts were white or whitish, more or less tinged with buffy, which was strong on the throat and an evident wash on the flanks. The tarsi were rather long and slender.

The Wheatear appeared practically neckless.

It had a way of standing quietly for some time in one place, puffed out to a sturdy, rotund figure, perched on slender feet, with the high, rounded dome of its gray head rising directly from the upper end of its body. When it was darting on foot after insects on the ground it depressed and extended its head, and appeared wide and flat. It pursued its prey with quick little darting runs, now here, now there, with head lowered. Sometimes it would flit about for greater or less distances rather restlessly, at other times it would stand entirely still, except for quiet but alert turning of the head, for minutes together.

When the bird was restive because of my close approach and observation, it would stand erect and regard me attentively, and occasionally would give a quick little bob and jerk, as though feigning to spring into the air, yet not moving its toes all the while. Sometimes such a jerk was accompanied by a quick, nervous flirt of the wings, exposing for a flash the white about the upper part of the tail, and sometimes it was not so accompanied. Of course, when the bird flew the white of the upper part of the tail was very conspicuous.

Occasionally I observed a slight wagging of the tail as the bird stood on the ground, but this tail-wagging was neither so pronounced nor so continuous as it usually is in the case of the Pipit.

At times the bird was feeding within thirty feet of me while I sat quietly and regarded it through my binoculars. I did not hear it utter any sound except the one *Chack!* that it uttered when it was first disturbed.

THE MOSS FLORA OF NORTH GREY COUNTY AND PART OF THE BRUCE PENINSULA, ONTARIO

By E. A. MOXLEY

DURING the past fifteen years, while studying and making photographic records of the wild flowering plants of North Grey County and part of the Bruce Peninsula, I naturally met many mosses, but prior to 1924 made no attempt to list the different species. Since then I have spent considerable time in studying and collecting the moss flora of this district.

It has been a pleasure to follow some of the trails of the late Prof. Macoun, and to find, after a period of over fifty years, many of the species

listed by him, from the localities he had mentioned.

Regarding the plants from the Bruce Peninsula; it will be noted that a number of rare species has been collected from this district, although only a small portion of territory has been gone over. Treacherous bogs, dense and tangled undergrowth, inundated and partly burned areas of swamp lands where camp sites were unavailable, hindered at times further explorations, and so the list is far from being complete, but having found so many rare plants

other than mosses, I have a keen desire to penetrate farther into this interesting country, which as yet has not been botanized to any great extent.

I am deeply indebted to Rev. H. Dupret of Montreal, who since 1924 has sent me weekly letters of instruction and authentic specimens of mosses for comparative study, and without whose help this list would not have been made. Also to Dr. A. J. Grout, Mr. R. S. Williams, and Prof. John M. Holzinger, whose kindly interest and generous information have been the means of placing a number of otherwise undetermined specimens.

SPAGNACEAE

Sphagnum squarrosum Pers.

Fruited, in bog beside road. Sauble Beach, Bruce County, May 14th, 1925.

Sphagnum cymbifolium (Ehrh.) Hedw.

Sterile, south end of Young's Lake, near Hoath Head, Sydenham Township, Grey County, July, 1925. Bog, south of mill, Sauble Falls. Fruited, May 14th, 1925.

Sphagnum acutifolium Ehrh.

In bog near Tobermory, Bruce County, June, 1924. Fruited.

GEORGIACEAE

Georgia pelucida (L.) Rabenh. (*Tetraphis pellucida* Hedw.).

Harrison Park, Owen Sound, April 13th, 1925. Base of cliffs West Hill, June 8th, also frequent on roofs of houses in the city.

POLYTRICHACEAE

Polytrichum commune L.

Dry, open woods, West Hill, Owen Sound, April 25th, 1925.

Polytrichum juniperinum Willd.

Open hillside, south end of Harrison Park, Owen Sound, May 14th, 1925.

Polytrichum piliferum Schreb.

On dry, shallow soil, West Hill, Owen Sound, April 20th, 1927. Male and female plants in separate clusters.

Catherinea crispa James.

On moist ledges in crevice, West Hill, Owen Sound, May 19th, 1925.

Catherinea undulata (L.) W.&M.

On clay banks in Harrison Park, July 8th, 1925. Frequent in woods beside Sydenham River, Owen Sound.

Pogonatum brevicaulis (Brid.) Beauv.

On clay bank disturbed by small landslide, near old power house, Sydenham River, Owen Sound, November, 1924.

FISSIDENTACEAE

Fissidens adiantoides (L.) Hedw.

Frequent in damp woods under West Hill, November 10th, 1924. Under cedars in damp woods, Sauble Beach, Bruce County, also on fallen and upright pine trees, mixed with *Tortella tortuosa*. An abnormal habitat for both plants.

Fissidens odmundoides (Swz.) Hedw.

Banks of clay, under trees on hillside, near old power plant, Sydenham River, May 17th, 1925.

Fissidens bryoides (L.) Hedw.

On moist earth, Harrison Park, Owen Sound, October, 1925.

Fissidens incurvis Stark.

On shaded boulders in ravine below Inglis' Falls, Sydenham River, Grey County, August 8th, 1925.

Fissidens grandifrons Brid.

On rocks in streams flowing into the Sydenham River near Inglis' Falls, Grey County, July 18th, 1925. On stones in Sauble River, Amabel Township, Bruce County, and on stones in Pottawatamie River, near Owen Sound.

Fissidens cristatus Wils.

In stream near village of Massie, Grey County, May 20th, 1925.

DICRANACEAE

Ditrichum flexicaule Hampe.

On exposed limestone, frequent on West Hill, Owen Sound, April 11th, 1926.

Swartzia montana (Lamk.) Lindb. (*Distichum capillaceum* B. & S.).

On sandy soil in pine woods, south of old road, Sauble Beach, Bruce County, August 8th, 1925. On shaded limestone under cliffs of West Hill, Owen Sound.

Seligeria calcarea B. & S.

In limestone crevices, West Hill, Owen Sound, July, 1925.

Seligeria Doniana C.M.

On walls of limestone fissures West Hill, Owen Sound, July, 1925. The most frequent of the species. Capsules in good condition from June until September.

Seligeria recurvata B. & S.

On detached boulders in rocky ravine under West Hill, Owen Sound, July, 1926.

Oncophorus Wahlenbergii Brid.

On rotten log in woods south of Harrison Park, Owen Sound, June 14th, 1925. On dry fallen pines in woods, Sauble Beach, Bruce County.

Ceratodon purpureus (L.) Brid.

Very common. Beside paths, on roofs of

houses and other buildings, fences, rotten and dry stumps in open woods.

Dicranum Bon Jeani De Not.

In swamp near village of Massie, August 24th, 1924. Frequent in wet, boggy depressions at Sauble Beach, Bruce County.

Dicranum alatum Ren. & Card.

On stumps, north end of West Hill, Owen Sound, August 14th, 1924.

Dicranum undulatum Ehrh.

Pine woods, Sauble Beach, Bruce County, August 30th, 1924.

Dicranum flagellare Hedw.

On dry, decayed log, woods, West Hill, Owen Sound, September 24, 1926.

Dicranum montanum Hedw.

On cedar trees, south of Harrison Park, Owen Sound, June 26th, 1926.

Dicranum scoparium (L.) Hedw.

On wooded, sandy hillsides, near Sauble Beach, Bruce County. (I have not yet found a fruited plant of this species. E.A.M.)

Dicranum viride (S. & L.) Lindb.

Frequent on decayed logs south of Harrison Park, Owen Sound, always sterile. November 22nd, 1925.

Dicranella varia (Hedw.) Schimp.

On clay banks beside Sydenham River, south of Harrison Park, September 3rd, 1925.

Dicranella rufescens (Dicks.) Schimp.

On banks of small stream, west side of Harrison Park, Owen Sound, November 23rd, 1925.

Dicranella heteromalla (L.) Schimp.

On sandy hill, near Sydenham River, Derby Township, Grey County, March, 1926.

Dicranoweisia crispula Lindb.

On shaded boulder in ravine below Inglis' Falls, Sydenham River, near Owen Sound, August 22nd, 1925.

Dichodontium pellucidum Schimp.

In cavity on flat limestone near Jones' Falls, Grey County, August 28th, 1926.

GRIMMIACEAE

Hedwigia albicans (Web.) Lindb.

On limestone boulders and flat limestone in partial shade, West Hill, Owen Sound, August 2nd, 1924.

Grimmia apocarpa var. *rivularis* (Brid.) W. & M.

On rocks, West Hill, December 10th, 1924. On rocks East Hill, Owen Sound. Frequent at both stations.

TORTULACEAE

Pottia truncatula (L.) Lindb.

On banks of Sydenham River, West of Second Avenue Bridge, Owen Sound, April 3rd, 1927.

Tortula mucronifolia Schwaegr.

On shaded rocks in ravine under north walls, West Hill, Owen Sound, June, 1925.

Tortula ruralis (L.) Ehrh.

On sandy knolls, Sauble Beach, Bruce County, July, 1926. In woods, West Hill, Owen Sound.

Gymnostomum calcareum Nees & Hornsch.

Base of cliffs near "The Pickets", East Hill, near Owen Sound, August, 1926. Near Jones' Falls, Pottawattamie River, August 28th, 1926.

Gymnostomum rupestre Schleich.

On shaded boulders beside Sydenham River, near Inglis' Falls, Grey County, July, 1926.

Gymnostomum curvirostre (Ehrh.) Hedw.

On wet ledges, Jones' Falls, Pottawattamie River, Grey County, August 28th, 1926. On damp walls of limestone, Inglis' Falls, Sydenham River.

Weisia viridula (L.) Hedw.

Frequent in fields, open hillsides and meadows.

Didymodon rubellus (Hoffm.) B. & S.

Edges of limestone crevices, on boulder, near Sydenham River, below Inglis' Falls, Grey County, September 7th, 1925.

Didymodon tophaceus (Brid.) Jur.

In calcareous stream, forming fossil-like tufts, Harrison Park, Owen Sound, June, 1925. See article by Adam Boros in *The Bryologist*, of May, 1925, regarding this plant. The conditions here are almost identical.

Didymodon luridus Horsnch.

In damp limestone niches, West Hill, Owen Sound, August, 1925.

Barbula fallax Hedw.

On clay bank, Fourth Street West, Owen Sound, October 29th, 1927.

Barbula unguiculata (Huds.) Hedw.

On dry banks of Sydenham River, west of Second Avenue Bridge, March, 1927.

Tortella tortuosa (L.) Limpr.

Frequent on rocks, West Hill, Owen Sound, fruiting abundantly in shaded places. On pine trees! Sauble Beach, October 18th, 1925.

Tortella fragilis (Drumm.) Limpr.

On dry, rotted pine logs, Sauble Beach, August 8th, 1925.

Tortella caespitosa (Schwaegr.) Limpr.

On north side of clay bank, near old power house Sydenham River, near Owen Sound, November 25th, 1925.

ENCALYPTACEAE

Encalypta streptocarpa Hedw.

Frequent on limestone ledges, West Hill, Owen Sound, September, 1924.

ORTHOTRICHACEAE

Orthotrichum anomalum Hedw.

On rocks beside spring at Harrison Park, Owen Sound, February 7th, 1925.

Orthotrichum sordidum S. & L.

On trees at Second Avenue East, near Cemetery Hill, Owen Sound, March 24th, 1925. On rocks, West Hill, Owen Sound, March 8th, 1925.

Orthotrichum obtusifolium Schrad.

On tree near village of Massie, Grey County, February 15th, 1925. On tree, Harrison Park, Owen Sound.

Orthotrichum speciosum Nees.

On tree in Harrison Park, Owen Sound, January 21st, 1928.

Ulotia americana (Beauv.) Lindb.

On rocks, West Hill, Owen Sound, March, 1925.

Drummondia clavellata Hook.

On tree (*Betula lutea*) in Harrison Park, Owen Sound, February 7th, 1925.

Drummondia clavellata var. *canadensis* Kindb.

On tree in Harrison Park, Owen Sound, January 21st, 1928.

FUNARIACEAE

Funaria hygrometrica (L.) Sibth.

On ashes at Sauble Beach, Bruce County, June 5th, 1925. Frequent on banks of Sydenham River, Owen Sound.

TIMMIACEAE

Timmia bavarica Hessel.

On moist rocks in ravine under West Hill, Owen Sound, June 10th, 1927. On rotten log in woods south of Harrison Park, Owen Sound, June 14th, 1925. A form with very short seta, collected at Jones Falls, Grey County, August 28th, 1926, remains undetermined.

AULACOMNIACEAE

Aulacomnium palustre Schwaegr.

In swampy woods east of 10th Line, Sydenham Township, Grey County, May 2nd, 1925. A very robust form beside small stream under West Hill, Owen Sound, November 19th, 1924. Extreme delicate form in long swamp, near Shallow Lake, Grey County, July, 1924.

Aulacomnium androgynum (L.) Schwaegr.

On shaded limestone walls, West Hill, Owen Sound, May 20th, 1924.

BARTRAMIACEAE

Philonotis fontana (L.) Brid.

In stream near village of Massie, with fruit in abundance, May 26th, 1925.

Philonotis caespitosa Wils.

On wet rocks in Sydenham River, near Inglis Falls, Grey County, August 22nd, 1927.

Bartramia pomiformis (L.) Hedw.

Edge of crevice, West Hill, Owen Sound, May 24th, 1925.

Bartramia Oederi. (Gunn.) Swartz.

Frequent on north side of boulders, under West Hill, Owen Sound, May 24th, 1925.

Catoscopium nigrum Brid.

On sandy banks of small stream, Sauble Beach, Bruce County, September 1st, 1925.

BRYACEAE

Mnium cuspidatum (L.) Leys.

On muddy banks beside stream, at foot of Creamery Hill, Derby Township, near Owen Sound, July, 1924.

Mnium affine var. *ciliare* (Grev.) C.M.

In damp woods, south of Harrison Park, Owen Sound, June, 1924.

Mnium orthorrhynchium B. & S.

On earth covered ledges of crevice, West Hill, Owen Sound, August 7th, 1926.

Mnium rostratum Schrad.

Moist woods, south-east of Harrison Park, July, 1925.

Mnium punctatum L.

Boggy woods, Sauble Beach, Bruce County May 14th, 1924.

Mnium punctatum var. *elatum* Schimp.

Harrison Park, Owen Sound, May 12th, 1925.

Bryum argenteum L.

Dry banks of Sydenham River, west of Second Avenue bridge, Owen Sound, October, 1924. Frequent at west end of city on earth and edges of sidewalks.

Bryum caespiticium L.

Frequent on dry limestone ledges on West Hill, Owen Sound, July, 1924.

Bryum pseudotriquetrum (Hedw.) Schwzegr.

On clay soil, open field, Owen Sound, South, August, 1924.

Rhodobryum roseum (Weis.) Limpr.

On rotten logs in woods, near Sydenham River, below Inglis' Falls, July, 1925.

Leptobryum pyriforme (L.) Wils.

North side of limestone boulders, West Hill, May 25th, 1925.

Polia nutans (Schreb.) Lindb.

On rotten stump in woods south of Harrison Park, Owen Sound, July 11th, 1925.

LESKEACEAE

Thuidium delicatulum (L.) Mitt.

On rotten logs in woods below Inglis' Falls, near Owen Sound, July 18th, 1925.

Thuidium abietinum (L.) B. & S.

On bare, flat limestone, West Hill, Owen Sound, July 15th, 1925.

Thuidium Blandowi (W. & M.) B. & S.

Under cedars in damp woods, Oliphant Beach, Bruce County, July 10th, 1927.

Thuidium Philiberti Limpr.

Under cedars in moist and dry woods, Sauble Beach, Bruce County, August 2nd, 1924.

Thuidium recognitum (Hedw.) Lindb.

On earth-covered limestone, under cliffs, East Hill, Owen Sound, May 2nd, 1925.

Myurella julacea (Vill.) B. & S.

On ledge in small crevice, West Hill, Owen Sound, August 2nd, 1924.

Myurella Careyana Sulliv.

At east end of long crevice, West Hill, Owen Sound, August 27th, 1924.

Anomodon apiculatus B. & S.

Base of trees in ravine under West Hill, Owen Sound, September 14th, 1924.

Anomodon attenuatus Schreb.

Base of trees in woods south of Harrison Park, Owen Sound, November 18th, 1924.

Anomodon rostratus (Hedw.) Schimp.

Fruited, on moist rocks beside Sydenham River, south of Owen Sound, December 8th, 1924. Sterile, frequent on walls of limestone cliffs, West Hill, Owen Sound.

Anomodon viticulosus (L.) Hook & Taylor.

On damp limestone walls, West Hill, Owen Sound, August 26th, 1924.

Leskea nervosa (Schwaegr.) Myrin.

Base of hemlock tree, Cemetery ravine road, Owen Sound, October 11th, 1925.

Leskea nervosa var. *nigrescens* (Kindb.) Best.

On shaded rocks under West Hill, Owen Sound, November 2nd, 1924.

HYPNACEAE

SUBFAMILY HYLOCOMIEAE

Hylocomium proliferum (L.) Lindb. (*H. splendens* B. & S.)

Pine woods, Sauble Beach, Bruce County, September 30th, 1924. On damp hillside, woods south of Harrison Park, and on shaded boulders in ravine under West Hill, Owen Sound.

Hylocomium pyrenaicum (Spruce) Lindb. (*H. Oakseii* Sulliv.)

On rotten log in ravine, north side of West Hill, Owen Sound, August 1st, 1925. Infrequent.

Hylocomium triquetrum (L.) B. & S.

On shaded hillside south of Harrison Park, Owen Sound, July 13th, 1925. Pine woods, Sauble Beach, Bruce County.

SUBFAMILY BRACHYTHECIEAE

Brachythecium acutum (Mitt.) Sulliv.

On rotten logs in woods under East Hill, south, August 23rd, 1924. On wet limestone ledge near shore of Georgian Bay, Lion's Head, Bruce County, June 11th, 1927.

Brachythecium apserinum Mitt.

On rotten leaves and twigs in south crevice, West Hill, May 31st, 1927.

Brachythecium campestre B. & S.

On debris in rocky ravine under East Hill, Owen Sound, March 30th, 1927.

Brachythecium digastrum C. M. & Kindb.

In thin mats on shaded limestone, under East Hill, Owen Sound, March 30th, 1927.

Brachythecium oxycladon (Brid.) J. & S.

On moist limestone boulders, West Hill, Owen Sound, May 24th, 1925.

Brachythecium oxycladon var. *dentatum* (G. & J.) Grout.

On bare limestone, West Hill, Owen Sound, May 24th, 1925.

Brachythecium reflexum (Starke) B. & S.

Base of tree (*Betula lutea*). In woods near Inglis' Falls, March 30th, 1927.

Brachythecium rivulare B. & S.

On moist bank of Pottawattamie River, near Jones' Falls, August 28th, 1926. Frequent on banks of small streams, Owen Sound.

Brachythecium rutabulum (L.) B. & S.

On rotten log in woods south of Harrison Park, Owen Sound, November 23rd, 1925.

Brachythecium populeum (Hedw.) B. & S.

On shaded limestone, West Hill, Owen Sound, August 22nd, 1926.

Brachythecium populeum var. *ovatum* Grout.

On earth in woods south of Harrison Park, Owen Sound, January 14th, 1928.

Brachythecium salebrosum (Hoffm.) B. & S.

In wet, boggy woods near Berkley, Grey County, October 18th, 1925. A slender form verging into *B. oxycladon* on rotten stump, open woods, near Inglis Falls, March 30th, 1927. A giant form on earth under trees in woods south of Harrison Park, Owen Sound, January 14th, 1928.

Brachythecium velutinum (L.) B. & S.

On earth, under trees in Harrison Park, Owen Sound, January 8th, 1927. Frequent.

Bryhnia graminicolor (Brid.) Grout.

In large mats on earth-covered ledges in south crevice, West Hill, Owen Sound, August, 1924. Sterile at this station since collected at the above date. (E.A.M., December, 1927).

Eurhynchium hians (Hedw.) J. & S.

In limestone fissures, West Hill, Owen Sound, November, 1924.

Eurhynchium strigosum (Hoffm.) B. & S.

On boulders, West Hill, Owen Sound, August, 1925.

Eurhynchium serrulatum (Hedw.) Kindb.

On damp rotten log in woods south of Harrison Park, Owen Sound, June 21st, 1925.

Eurhynchium rusciforme (Neck.) Milde.

On rocks, submerged in small stream, below Jones' Falls, Sydenham River, near Owen Sound, August 28th, 1926.

Camptothecium nitens C.M.

In wet sandy meadow, Sauble Beach, Bruce County, June, 1927. Although usually sterile, fruited plants may be collected at this station.

SUBFAMILY CLIMACEAE

Climacium dendroides (L.) Web. & Mohr.

On decayed log in boggy woods near Woodford, Grey County, December 2nd, 1924. On log in depression near Sydenham River, south of Owen Sound. Also wet places in ravine under West Hill, Owen Sound.

SUBFAMILY POROTRICHEAE

Porotrichum alleghaniense (C.M.) Grout.

Frequent in crevices and damp ravines, West Hill, Owen Sound, August, 1924.

SUBFAMILY AMBLYSTEGIEAE

Drepanocladus aduncus (Hedw.) Warnst.

Group Kneiffii, var. intermedium (B. & S.) Roth. In sandy bog, Sauble Beach, Bruce County, August 8th, 1925.

Drepanocladus aduncus (Hedw.) Warnst.

Group typicum Ren. var. aquaticus Sanio. In drying pond, Seventh Avenue East, Owen Sound, near Derby Township line, May 24th, 1925.

Drepanocladus revolvens (Sw.) Warnst.

In bog, Sauble Beach, Bruce County, June 5th, 1926.

Drepanocladus revolvens var. *intermedius* Lindb.

In pond south of Harrison Park, Owen Sound August, 1924.

Drepanocladus vernicosus (Lindb.) Warnst.

In bog, Sauble Beach, Bruce County, June 5th, 1926.

Drepanocladus subpiligerus Ren.

In stream beside road, two miles north of Lion's Head, Bruce County, June 7th, 1925.

Drepanocladus uncinatus (Hedw.) Warnst.

In bog, Sauble Beach, Bruce County, April 5th, 1925.

Cratoneuron filicinum (L.) Roth.

On wet bank beside stream, south of Harrison Park, Owen Sound, June 25th, 1925. South bank of Jones' Falls, Grey County, August 28th, 1926.

Cratoneuron commutatum var. *falcatum* Muell.

Edge of wet, sandy meadow, Sauble Beach, Bruce County, August 14th, 1927.

Calliergon cordifolium (Hedw.) Kindb.

In stream under West Hill, Owen Sound, April 14th, 1925. Bog, Sauble Beach, Bruce County. Bog, East Linton, Grey County.

Calliergon giganteum (Schimp.) Kindb.

Bog, Sauble Beach, Bruce County, May 4th 1925.

Calliergon Schreberi Willd.

Damp woods, Sauble Beach, Bruce County, August 8th, 1925.

Calliergon cuspidatum (L.) Lindb.

In bog, Sauble Beach, Bruce County, August 14th, 1927.

Calliergon trifarium W. & M.

Mixed with other plants in bog, Sauble Beach, Bruce County, June 5th, 1926.

Calliergon turgescens Schimp.

In bog near Sauble River, Sauble Beach, May 4th, 1925. Plants at this station average three inches in length. About two miles south in a bog east of pine trees, the plants attain a length of one foot!

Campyllum chrysophyllum (Brid.) Bryhn.

Woods south of Harrison Park, Owen Sound, August 8th, 1925. Frequent on banks of Sydenham River, and damp woods, Sauble Beach, Bruce County.

Campyllum hispidulum (Brid.) Mitt.

On shaded hillside beside Sydenham River, north of Inglis' Falls, Grey County, May 29th, 1926.

Campyllum stellatum (Schreb.) Bryhn.

In second bog east of cottages, Sauble Beach, Bruce County, August 8th, 1925.

Campyllum polygamum (B. & S.)

In bog near Clavering, Bruce County, June 7th, 1927. Sauble Beach, August 8th, 1925.

Amblystegium compactum (C. Muell.) Aust.

On rotten stump in wet woods, east of 10th Line, Sydenham Township, Grey County, June 7th, 1927.

Amblystegium irriguum (Wils.) B. & S.

On wet boulder beside Sydenham River, near Inglis' Falls, July 18th, 1925.

Amblystegium irriguum var. *spinifolium* Schimp.

In small stream under West Hill, Owen Sound, May 25th, 1925.

Amblystegium irriguum forma *marianopolitana* Dupret.

In stream under West Hill, Owen Sound, May 25th, 1925.

Amblystegium noterophilum (Sulliv.) Warnst.

On stones in overflow of fish pond, Harrison Park, Owen Sound, October 10th, 1924.

Amblystegium orthocladon (P.B.) Kindb.

On wet decayed log, site of old power plant, Sydenham River, near Owen Sound, May 2nd, 1925.

Amblystegium varium (Hedw.) Lindb.

Base of hemlock tree in Cemetery ravine, Owen Sound, October 10th, 1925.

Amblystegium varium var. *oligorhizon* Bry. Eur.

On log in small stream beside clay bank, near Sydenham River, south of Harrison Park, June 14th, 1925.

Amblystegium riparium B. & S.

On stones submerged in stream below Jones' Falls, August 28th, 1926.

Amblystegium riparium var. *longifolium* (Schultz.) B. & S.

Attached to roots of trees in swamp, beside Boai Lake, Bruce County, June 10th, 1927.

SUBFAMILY HYPNEA

Hygrohypnum eugyrium (B. & S.) Loeske. (Schimp. ?).

On wet rocks in Sydenham River, below Inglis' Falls, August 1st, 1925.

Hygrohypnum dilatatum (Wils.) Loeske.

On stones in stream near Massie, Grey County, July 22nd, 1925.

Hygrohypnum arcticum Sommerf.

On stones in Indian River, Sarawak Township, Grey County, July 7th, 1927.

Scorpidium scorpioides (L.) Limpr.

Second bog east of cottages, Sauble Beach, Bruce County, August 15th, 1925.

Hypnum Crista-castrensis L.

On rotten log beside stream south of fish pond, Harrison Park, Owen Sound, November 22nd, 1925.

Hypnum imponens Hedw.

On rotten log in woods south of Harrison Park, Owen Sound, April 24th, 1927.

Hypnum Patientiae Lindb.

In woods south of Harrison Park, Owen Sound, June 24th, 1925. On rotten log in woods, Sauble Beach, Bruce County. On wet, clay hillside, Fourth Street West, Owen Sound.

Hypnum reptile Mx.

On rotten log in woods below Inglis' Falls, Grey County, July 18th, 1925.

Hypnum Haldanianum Grev.

On decayed stump in woods south of Harrison Park, Owen Sound, September 4th, 1924.

Hypnum recurvans (Mx.) Schwaeger.

In woods on West Hill, Owen Sound, November 8th, 1924.

Plagiothecium turfatum Lindb.

In woods below Inglis' Falls, Grey County, August 1st, 1925.

Plagiothecium deplanatum (Sch.) Grout.

Base of beech tree, opposite race track, Fourth Avenue West, Owen Sound, September 23rd, 1924.

Plagiothecium denticulatum (L.) B. & S.

Base of beech tree in woods on West Hill, Owen Sound, August 15th, 1924.

Plagiothecium sylvaticum (Huds.) B. & S.

Long Swamp, Grey County, April 15th, 1925. Frequent in woods about Owen Sound.

Plagiothecium Ruikei Limpr.

One earth at edge of south crevice, West Hill, June, 1927.

Amblystegiella adnata (Hedw.) Nichols.

On exposed roots of beech tree, summit of Cemetery Hill, Owen Sound, January 7th, 1928.

Amblystegiella subtilis (Hedw.) Loeske.

On rotted birch log near old power house, Owen Sound, November 8th, 1926.

Platygyrium repens (Brid.) B. & S.

On maple tree, Tenth Street West, Owen Sound, January 17th, 1925. Frequent.

Pylaisia Schimperi R. & C.

On tree in Harrison Park, Owen Sound, February 14th, 1925.

LEUCODONTACEAE

Leucodon sciurioides (L.) Schwaegr.

On maple tree, Harrison Park, Owen Sound, December 27th, 1924.

NECKERACEAE

Homalia Jamesii Schimp.

On shaded limestone walls, north side of West Hill, Owen Sound, August 22nd, 1925.

Neckera pennata (L.) Hedw.

On basswood tree south of Harrison Park, Owen Sound, June 14th, 1925. On earth-covered boulder in ravine under East Hill, Owen Sound. Abnormal habitat!

FONTINALACEAE

Fontinalis dalecarlica B. & S.

In stream at East Linton, Sarawak Township, Grey County, July 7th, 1927.

Fontinalis Nova-Angliae Sulliv.

In small streams at Rock Mills, Grey County, October 18th, 1925.

Fontinalis antipyretica L.

In stream from spring beside road near Inglis' Falls, Grey County, June 18th, 1925.

Dichelyma capillaceum B. & S.

Attached to root of tree in bog at north end of Boai Lake, Bruce County, July 10th, 1927.

Dichelyma pallescens B. & S.

Attached to roots of tree in bog, north end of Boai Lake, Bruce County, July 10th, 1927.

CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF NORTH-EASTERN LABRADOR

By BERNARD HANTZSCH

"Beitrag zur Kenntnis der Vogelwelt des nordöstlichsten Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechshundfünfzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July, 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II. Besonderer Teil (Detailed Part), pages 307-392. (Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.)

Continued from p. 177

Aethya affinis affinis (Eyt.) [p. 338] *Purpurschillernde Berg-Ente*.—LESSER SCAUP DUCK. —or— *Aethya marila nearctica* Stejn. *Grünschillernde Berg-Ente*.—AMERICAN SCAUP DUCK.³³

Since unfortunately I could obtain no material in the district bearing at all on the question, I was unable to decide which of the two species (or subspecies ?) or whether both of them appear as rather rare breeding birds. The literature is very uncertain on this point and the nomenclature is also variable and not clear. I follow herein at present Stejneger's lucid description in the Bull. U.S. Nat. Mus., No. 29, 1885, p. 161, without possessing satisfactory judgment about the suitability for the purpose in view.

J. Macoun says, on the basis of the notes and collections of R. Bell, that *Aethya affinis* (*affinis*) breeds in large numbers on Nottingham Island, at the western outlet of Hudson Strait (I, p. 93), and Bigelow states that he has received a specimen of *A. marila* (*nearctica* Stejn. ?) which was shot near the mission station of Nain in October, 1889. He considers this occurrence the only proof of the species on the east coast of Labrador

(1902, p. 27). I suspect that the Scaups, which I met in the northeast of Ungava Bay, belonged to *A. a. affinis*, without having actual proof for it. On 12th August I noticed from a distance, a female on a freshwater lake near the shore, with small young which dived under at our careful approach. [p. 339] There was nothing more to be seen of the young at all, but the old duck appeared for a moment with the head up and down above the water, vanishing again each time at once. When my Eskimo companion at last ventured a quick shot, which apparently had no effect whatever, the bird flew out of the water quite suddenly and hastened very quickly toward the shore, which was much cut up with ravines.

The downy young remained out of sight and seemed to sit motionless on the grass-covered edge of the lake. At least one of the green-yellowish creatures suddenly bounced into the clear water like a frog, close in front of me, and paddled away in the distance quick as lightning. I recognized the colouring of the downy coat exactly, since in Iceland I had held young Scaups by the dozen in my hands. In spite of long-careful search the young and old remained out of sight. I scarcely remember having ever seen such ducks anywhere. The other time I observed several old birds on 18th August on a large lake in the hinterland of the inlet Takpangajok, Ungava Bay, in company with several families of *Mergus serrator* [Red-breasted Merganser]. These birds also protected themselves with great caution, swimming into the middle of the lake where a shot would not reach them. An exact determination of these specimens in summer plumage was not possible. After this, Scaup ducks never came into my sight.

³³ In the A.O.U. Check-List, 1910, these species are listed as *Marila affinis* (Eyton), Lesser Scaup Duck, and *Marila marila* (Linnaeus), Scaup Duck.—R.M.A.

Clangula clangula americana (Bp.)³⁴
[p. 339] *Amerikanische Schell-Ente*.—AMERICAN
GOLDEN-EYE.

Eskimo: *Katjitok*, -*ták*, -*tut?* (*partim?*)

Probably migrant or visitor, which, however, is generally not distinguished from *Clangula islandica* [Barrow's Golden-eye]. Turner collected specimens of this species in the south of Ungava Bay, where according to his reports they appear in great numbers in autumn. He also notes them as abundant fall migrants for the Labrador coast (1886, p. 250).

Clangula islandica (Gm.)³⁵. [p. 339].
Spatel-Ente.—BARROW'S GOLDEN-EYE.

Eskimo: In Killinek *Katjitok*, -*ták*, -*tut* (etymology not clear); according to Weiz *Uviloktut* (*Uvilok*=edible mussel, -*tut*, possibly a combination of the word suffix -*torpok*=to eat with pleasure, to devour).

Not rare breeding bird in the back part of some inlets cutting deep into the land and in nearby ponds of our district. Macoun knows this species only as a visitor of the Atlantic coast, southward from Hudson Strait; in the North they are said to appear more frequently (I, p. 96). Turner noted them as abundant in that place in the fall (1886, p. 250). According to the observations of Missionary Perrett, the bird occasionally appears as a migrant in northeastern Labrador in great numbers [p. 340]. but in this connection a confusion with *Clangula c. americana* is not precluded.

A young male in the first plumage, which had not completed moulting, killed by me at the breeding place at Killinek, 30th August, 1906, upon which some of the fringed scapular feathers (Schulterfedern) of the full plumage characterizing the species, were to be seen, thus excluding any confusion with *C. c. americana*, shows the following measurements: Weight in the flesh: 1120g. Total length: 480 mm. Spread of wing (incomplete): about 750. Wing (incomplete): 185, Tail (incomplete): 98. Bill from the feathering of the forehead: 33. Tarsi: 40. Middle toe including the 8 mm. long claw: 65 mm. Bill: uniformly blackish. Feet: upper side of the tarsi and toes: yellow-brown, the rest black. Iris, shining light yellow. The stomach contained sand, small stones, snails and remains of mussels; another was empty (Rörig).

Somewhat north of the mission station Killinek there is a narrow, deep inlet which widens at the end like a lake. This species bred at that place as also at some similar, neighboring places, in considerable numbers up to six to eight years ago. Every year at the end of August when the young

were about ready to fly and the females were moulting the wing quills, several people went there. Some climbing up quietly on the land and concealed themselves at different points behind the steep rocks by the inlet, which was scarcely ten metres wide. Others rowed carefully up to the widening of the inlet, so like a lake, and began to shoot everything that came in front of their guns. Many of the surprised birds saved themselves by diving under the water, but whenever they were about to escape into the sea, swimming out of the narrow inlet, for the most part they were killed by the hunters in ambush. When at last there was not another living bird, they collected the dead birds floating on the water, and as Mr. J. Lane told me, they brought whole boat-loads home. In later years, probably because of this shooting, the ducks have decreased very much in numbers. The trip which I took with the Eskimos on 10th August, gave as a result only six to eight birds, an old female and several young ones, which were moulting so that they were not suited for preparation. The above mentioned specimen was the best. Old males did not seem to be in the inlet, although perhaps a bird which saved itself by flying was such a one. The rest did not seem to act particularly shyly, but swam almost always under the water and did not show themselves except for a short time to breathe with head and neck above the surface. A whole lot escaped us, fortunately for them, since on account of the wind we could not turn our boat quickly enough. An Eskimo who accompanied us at the beginning in his kayak, took two specimens of *Histrionicus* [Harlequin Ducks] and one or two of this species in a neighbouring inlet. Other hunting trips for the birds in the year 1906 were not undertaken.

Harelda hyemalis (L.)³⁶ [p. 341]. *Eis-Ente*.—OLD SQUAW.

Eskimo: *Aggek*, -*gik*, -*git*, in the South more *Angek* (like the striking voice of the male).

A well-known, even if in no way abundant, breeding bird on freshwater ponds. At Killinek in August I only observed some females with their young a few times, drakes not at all. According to the reports of the Eskimos the drakes are said to assemble during the summer on large lakes farther in the interior of the mainland and not to collect with the females and the offspring until considerably later, after the end of the autumn moult.

A male and female, breeding pair, in my collection, from Rama, July 1, 1907, taken with

³⁴ *Glaucionetta clangula americana* Bonaparte, 18th Suppl. to A.O.U. Check-List, 1924.—R.M.A.

³⁵ *Glaucionetta islandica* (Gmelin), 18th Suppl. to A.O.U. Check-List, 1924.—R.M.A.

³⁶ *Clangula hyemalis* (Linnaeus), 37th Suppl. to A.O.U. Check-List, 1920.—R.M.A.

eggs, show following measurements: Wing: 215, 208. Tail: 227, 82. Bill, from the feathering of forehead: 27, 26. Tarsi: 35, 32. Middle toe including the 8 mm. long claw: 57, 53 mm. respectively.

The mothers show great concern about their four to eight young as long as these are small. Toward human beings, however, they are not at all shy. With a low *Rack, Gack, Quack*, they call the dainty little creatures to them; when anxious, the calls are repeated more quickly, shorter, and somewhat louder.

Macoun calls this species very common along the whole Atlantic coast. This applies to our district most decidedly at certain migration periods. He notes them for Ungava Bay, Hudson Strait, etc. (I, p. 98), and Kumlien for southeast Baffin Island (1879, p. 89). Doubtless the Oldsquaw [*Eis-ente*, ice-duck] besides *Somateria mollissima* [Eider], is the most widely distributed and richest in individuals of the duck species of the Arctic regions.

Histrionicus histrionicus (L.) [p. 341].
Kragen-Ente.—HAREQUIN DUCK.

Eskimo: *Ingiuliksuit*, -*siutik*, -*siutit* (*ingilik* = strong current, sand-dunes, waving of wings, -*siut* = what its nature demands, accustomed to keep up).

Not rare breeding bird in the inner part of inlets of the sea and on inland waters with strong currents. Occasionally more abundant at time of migration. Turner says that the species has been observed in numbers in Hudson Strait and breeds in Ungava Bay (1886, p. 250). According to Macoun it also appears frequently on the whole east coast of Labrador (I, p. 101), and Kumlien records it for Cumberland Sound (1879, p. 89). At Killiney specimens came into my hands only a few times, and these were so strongly moulting that I gave up their preparation.

An adult male in my collection from Okak, spring of 1905, shows the following measurements: Wing: 196 mm. Tail: 110. Bill (p. 342), from the feathering of the forehead: 27. Tarsi: 37. Middle toe including the 7 mm. long claw: 60 mm.

During the summer these birds live quietly and in retirement, but are well known and prized on account of their flesh.

Somateria mollissima borealis (Brehm) [p. 342]. *Brehm's nördliche Eider-Ente*.—GREENLAND EIDER. [Northern Eider].

Eskimo: *Mittek*, -*lik*, *tit* (in the North plural also *Merkit*; etymology not clear, perhaps from the voice); male in full plumage: *Amaulik*, -*lik*, -*lit* (from *amaut* = hood on woman's mantle, on account of the marking on head and back, -*lik* = having, furnished with it); female: *Arnaviak*, -*ak*, -*at* (from *arnak* = woman).

Abundant resident on the sea-coasts and in some places a breeding bird, which nests in colonies; by far the most frequent representative of the Anatidæ. It is true that the slow diminution of the species is affirmed by the natives, but the exceedingly sparsely inhabited districts of neighbouring Baffin Island, where according to dependable reports which I received, the whole south coast of Baffin Island is inhabited at present by scarcely more than thirty families, will yield for a long time sufficient fresh supply in case there should be too much destruction in our district.

In the present work I refrain from adding critical remarks on the eiders of Labrador and neighbouring regions, since I hope to be able to give a better judgment later on the ground of more detailed investigations and more abundant material. I secured only moulting birds myself and not a single male in full plumage. But they are all characterized, particularly on the basis of the lateral feathered points on the bill running to a point in the same manner as *S. m. borealis*.

These points are indeed said to be very broad and to be rounded at the end in *S. m. dresseri* Sharpe. If the diagnoses advanced are correct in general, then *S. m. dresseri* should not occur in our district. John Macoun in his Catalogue of Canadian Birds accepts the statements about the distribution of both forms in Hudson Strait, Ungava Bay, and northeastern Labrador, without special criticism and others do this in like manner, so that it would raise the probability that they occur together. Were this really the case, one would have to dispute the justification of separation into subspecies. I am trusting at present only in an imperfect determination of the collected material of some informants. Such determinations from eggs are naturally quite impossible, as W. Raine in Toronto does not only here but also in many other cases, according to Macoun's citations (I, p. 105). Bigelow's statements might perhaps prove correct, namely that the approximate limit of the breeding range of both forms lies at Hamilton Inlet; northwards, *borealis*; southwards, *dresseri* (1902, p. 27).

Five grown examples in my collection, that is birds no longer in the first year, of which 2 males in moulting from summer into winter plumage, and 3 females [p. 343] decidedly in a somewhat more advanced stage of moulting, from the Snow Bay, Tassiojak, in the extreme northeastern end of the Labrador mainland, show the following measurements: Weight in the flesh: 1840-1960 g. Total length: 520-540 mm. Wing spread: 820-900. Wing: 205-230. Tail: 82-100. Tail + wing: 79-95 (on account of the moult the incomplete measurements have slight significance). Bill, from the anterior end of the point of forehead to tip of bill: male, 50-52; female, 47-49; distance from anterior end of the lateral pointed extension of feathers to tip of bill: 32-36; from corner of mouth to the posterior end of frontal process of bill upon the forehead: 25-27; between the two fork-like frontal processes of bill upon the forehead: 12-15. Tarsi: 47-50. Middle toe including the 10-11 mm. long claw:

68-72 mm.; females in these points not smaller than the males. In a young female of September 29th the measurements of the body are less to be sure, those of the bill and feet only insignificantly so. Iris: dull brown-black. Bill: male dusky yellow, greenish-yellow on the tip; lower bluish white-gray; female dusky olive-green, greenish-yellow-gray at tip, at the base more bluish-gray. Feet: anterior side of the tarsi, upper side of the toes and a stripe alongside these yellow-brown, the rest blackish. 4 stomachs examined contained in four cases small stones, one time splinters of mussel-shell, remains of mussels, little black snails, crustaceans, unidentifiable remains of creatures, and feathers (Rörig).

A considerable percentage of the eider-ducks present in a district have not reached the age of propagation, as I have already observed to be the case in Iceland. It is most probably to be assumed, that these are the younger birds, particularly the males in the spring after their hatching, which yet do not put on the pure adult plumage at all. In what year of their lives these birds attain to the age of propagation, or what remarkable irregularities their breeding is subject to, is still insufficiently known. Friedrich Faber maintained that our species, at least the males, did not become capable of breeding until the fourth or fifth year (Hochnordische Vögel, I, 1826, pp. 82, 98), and later ornithologists have not rejected his conclusions.

I constantly met larger and smaller flocks of birds of both sexes from 25th July, when we were travelling along the coasts of Resolution, up to October. They remained on flat parts of the coast, rich in islands and cliffs, and later, at the time of migration, liked to stay in protected inlets, and if not unexpectedly surprised, were shy and cautious. The whole flock almost always dived under, and only when the scattered ones came up for a short time to get breath could they be killed with large shot. That these numerous birds had not reached the age of breeding was shown by the condition of the genitals of specimens examined, for one thing, and for another the fact that in no case were young or half-grown creatures seen with them. Not until the end of September did we observe and kill such specimens [p. 344], when the migration set in, the birds combined in large flocks, often numbering hundreds, and flew restlessly higher than usual at greater distances through the air. On the coast of Resolution Island, where the species had considerable breeding colonies, as well as some times during the first half of August in Ungava Bay, I observed flocks which consisted only of drakes in the nuptial plumage, or the beginning summer plumage and arranged themselves on their long flights in

a row regularly behind one another. I suspected that these were the males of the breeding birds, which left their breeding places after the coming out of the young, or which still visited their mates now and then as long as these stayed with the young near the nesting places. In the companies of individuals not yet of breeding age I found both sexes mingled, while later, on the autumn migration, they frequently were separated from one another. These younger birds now and then placed themselves in rows, also in chains of 30, 40 and still more links, but seldom so regularly and well arranged. In larger flocks of several hundreds, as they appeared toward the end of September, they often flew in broad swarms.

The only breeding place of importance in our district is located on several small islands north-east of Aulatsvik on the Labrador coast, where thousands of pairs are said to nest. In former times eggs were brought from there occasionally, but since the trade in down has paid so well several families from Killinek journey annually to the island, and also some from Aulatsvik, in case weather and ice conditions permit. They then disturb the birds, not only by taking away the down, but also by vigorous shooting. The possibility will therefore have to be faced, that the creatures will sometime desert their breeding place. Quiet behaviour on the part of visitors and most practicable, avoidance of every shot near the nests, might be impressed upon the natives with all firmness, in order that the advantage of collecting down and obtaining eggs might not be lost. The European settlers should make use of the experience, which the Icelanders, for example, have obtained with the eider-birds and have formulated properly in this respect through their shooting regulations.

The large, fleshy creatures form a favourite food of the Eskimos and their hunting passion awakens excitedly whenever they observe *Mittel*. According to age and season, the birds are plucked or skinned, then taken out and merely boiled in sea-water. They form a very tasty dish, even if, according to the rules of cookery they are more to our European tastes when roasted. The manufacture of the very warm down covers by plucking the covering feathers on the body, as the Greenlanders understand how to do so well, is unfortunately not known in Labrador at the present time.

Somateria spectabilis (L.) [p. 345] *Pracht-Eider-Ente*.—KING EIDER.

Eskimo: *Kingalik*, -lik, -lît (from *kingak* = nose, -lik = furnished with it; usually used only for

the male in full plumage, the female not being usually distinguished from the ordinary eider-ducks).

Frequent visitors of the coasts, but only a sporadic breeding bird. It is also firmly established in the case of this species, that all of the specimens observed in our district by no means breed. Macoun certainly may be right when he assumes that the King Eider breeds on the Atlantic coast (I, p. 107); whether, however, eggs collected really belong to this species, must be proven in every single case. As far as my inquiries correspond to the facts, the King Eiders have no special breeding colonies in northeastern Labrador, but keep in the company of *Somateria mollissima*. But because the females of both species are seldom distinguished by the native population, and the drakes at the end of breeding hardly return to their nests more regularly, mistakes are likely because of the similarity of the eggs of both birds. According to the assurance of the Killinek people, one meets this species in the midst of the large eider-duck colony north of Aulatsivik.

According to Payne the birds breed at Cape Prince of Wales, Hudson Strait, on little coastal islands (Macoun, I, pp. 107-8). Three eggs were collected according to Macoun, by A. Ford in Nachvak, a place situated very near to our district (*l. c.*). According to inquiries by Kumlien from the natives of Cumberland Sound, these birds are said to keep separated from the common eider-ducks there (1879, p. 93). Other observers state the same thing, as for example, A. Koenig, who has called special attention to this condition in Spitsbergen. On migrations the bird is quite abundant in all our districts. The creatures often remain far from land.

A rather old female in my collection, of 20th August, and a similar one of the same year's brood, of 20th September, both killed near Killinek, show the following measurements: Weight in the flesh: 1325, 1350 gr. Total length: 540, 525 mm. Spread of wing: 910, 900. Wings: 260, 254. Tail: 98, 97. Tail+wing: 26, 30. Bill: from anterior end of the point of forehead to tip of bill: 31. Distance from the anterior end of the lateral feathered extension to tip of bill: 40, 39. From corner of mouth to posterior end of frontal processes of bill upon the forehead: 19. Between the two forked frontal processes of beak upon the forehead: 15, 13. Tarsi: 45. Middle toe including the 11, 9 mm. long claws respectively: 63 mm. Iris: dark-brown. Bill: dull dark gray-black, dark greenish-gray respectively. Throat skin lighter, more flesh-coloured. Feet, tarsi, and upper side of the toes, as well as stripes near these, dark brown and reddish yellow-brown respectively, (p. 346). Middle of the webs and soles blackish. The old bird is just beginning to moult a little, the younger is wearing the first plumage nearly finished with

moulting. The two stomachs contained in one case small pebbles, remains of mussel-shells, fragments of a red mussel, a snail, and unidentifiable remains of creatures. (Rörig).

I did not see a male in full plumage on my Labrador journey. The few females collected were with males and females of *Somateria mollissima*. They are tenacious of life and are generally lost if they are not mortally wounded at once or are hindered from diving by breaking a wing or foot bone. The flesh and the somewhat darker down are prized just as much as those of the ordinary eider-duck.

Oidemia nigra americana (Sw.)³⁷ [p. 346].
Amerikanische Trauer-Ente.—AMERICAN SCOTER.

Eskimo: *Uvingiajok*, -*jûk*, -*jut* (questionable, whether connected with *uvingajok*=a sloping surface).

Apparently not rare migrant and sporadic breeding bird in the hinterland of southeastern Ungava Bay. According to Missionary Perrett, the species is at times quite abundant in migration near the southern mission stations of the Moravian Brethren. However, this was not the case in 1906, for I did not see a single specimen. Bigelow also calls the bird common on the Labrador coast (1902, p. 28), and Turner states that the species appeared abundantly during the fall migration in Hudson Strait and on the east coast of Labrador, even if breeding there only sparingly (1886, p. 250). Kumlien also saw "Scoters" at different times from the Labrador coast up to latitude 67° North, but could not identify the species (1879, p. 93). One may depend little on the reports of the Eskimos in the case of the *Oidemia*-species, so like one another.

Oidemia fusca deglandi Bp.³⁸ [p. 346].
Degland's Samt-Ente.—WHITE-WINGED SCOTER.

Eskimo: According to Missionary Perrett *Pitsiulakpak*, -*pâk*, -*pait* (*Pitsiulak*=*Cephus* [Guillemot], -*pâk*=a large); also *Tuglerunak*, -*nâk*, -*nat*, perhaps only for the females (according to v. Schubert so called on account of the two white eye-spots; the same name for the plant *Rhodiola rosea* L., ("Fat Hen"); probably these names *partim* also for *Oidemia nigra*).

Apparently also a migrant, even if rarer than *O. nigra*. In many years it is said to appear rather abundantly on the northeastern coast of Labrador, and also to breed frequently farther in the south of the country, as Bigelow states

³⁷ *Oidemia americana* Swainson of A.O.U. Check-List, 1910.—R.M.A.

³⁸ *Oidemia deglandi* Bonaparte of A.O.U. Check-List, 1910, although A. C. Bent in "Life Histories of N.A. Wild Fowl," 1925, p. 131, follows W. deW. Miller, "The Classification of the Scoters," *The Auk*, XXXIII, 1916, p. 278, in restricting the genus *Oidemia*, and listing the present species of *Melinita icelandi* (Bonaparte).—R.M.A.

(1902, p. 28), and (p. 347) Missionary Perrett confirms. For our more restricted district, to be sure, there exists no material for proof, even if W. W. Cooke writes that the species breeds in Labrador northward to Nachvak (U.S. Dept. Agri., Biol. Surv. Bull. 26, 1906, p. 61).

Oidemia perspicillata (L.)³⁹ [p. 347.]
Brillen-Ente [Spectacled Duck].—SURF SCOTER.

Eskimo: *Sorluktok*, -*tûk*, -*tut* (=has the cold in the head; either from the swollen place near the nostrils, or on account of the voice). According to Missionary Perrett, also *Orksuliojártok* (from *orksuk*=blubber (Speck), *orksulik*=provided with blubber, *ujártok*=is like (or similar to); perhaps from the thick layer of fat under the skin.) The young said to be *Kejuktungiak* from *kejuk*=wood?).

Rare migrant and visitor; apparently more frequent and not breeding until farther south. Turner notes our species, probably correctly, only as a rare breeding bird along the coast of Labrador (Macoun, I, p. 111). According to Missionary Perrett this is more regularly the case southward from Okak, and particularly in the hinterland. The natives of George River, Ungava Bay, knew nothing of its breeding in the neighbourhood. On the migration our bird freely joins the company of the other *Oidemia*-species. Bigelow, indeed, calls it abundant on the coasts of Labrador (1902, p. 20), yet this statement might at best be applicable for the southern parts of the country. Spreadborough met it in Hudson Strait, although merely as a rare migrant (Macoun, I, c.). Turner also calls it a rare visitor for this district (1886, p. 251), and I observed no specimen at all with certainty.

One skin in my collection, adult male, even if with rather narrow white forehead and neck spots, of the spring of 1905 from the region of Okak, shows the following measurements: Wing: 240 mm. Tail: 97. Bill: from the middle feathering of the forehead: 37; from the most posterior feather ends to tip: 60. Tarsi: 42. Middle toe including the 8 mm. long claw: 66.5 mm. Bill, in the skin, vivid bright red, only on the forehead are there a few little blackish specks. Feet: brownish-red.

Chen hyperborea (Pall) [*nivalis* (Forst.) ?]
[p. 347.] *Schnee-Gans*.—SNOW GOOSE,

Eskimo: *Kangu*, -*ûk*, -*ut* (probably after the voice).

Snow Geese visit our district as not rare migrants, it is said, especially in the spring, when at times they are said to be observed and killed on the whole eastern part of Ungava Bay in considerable numbers.

To which subspecies the birds belong, however, is uncertain. As far as we know, in general, the geographical distribution of the different forms, this is probably *C. h. nivalis* (Greater Snow Goose) the (p. 348) more exact breeding places of which could not be ascertained. Less probable is the occurrence of the more Western *C. h. hyperborea* (Pallas), [Snow Goose, Lesser Snow Goose], even if Turner expressly states that the Lesser Snow Goose appears rather frequently on Southampton Island and Baffin Island (1886, p. 249); Eifrig also maintains that this form breeds on islands along the east coast of Hudson Bay (1905, p. 237). Kumlien's statement, that he had observed several snow geese migrating in early spring and late fall in Cumberland Gulf, and which he ascribes to the latter form (1879, p. 88), is of slight significance, since the subspecies can scarcely be identified by sight in the distance. George Barnston, on the other hand, reported in 1861, that *C. h. caerulescens* (L.) [Blue Goose] bred abundantly in northwestern Labrador (*Canadian Naturalist*, VI).

I am unfortunately not in the position of proving the correctness of these views, especially since during my whole stay in Labrador I never saw a single Snow Goose. Certain statements about the breeding in our district are, on the other hand, manifestly erroneous; the Snow Geese would seek out only wide-spreading swampy, low-lying land for breeding places, and such are entirely lacking in northeastern Labrador. Whether they find suitable places deep in the inner part of the country, which is so little explored, is also not very probable. Baffin Island, lying somewhat farther northward, with its large, lowland lakes, appears much more favourable in this respect. Mr. Crawford Noble of Aberdeen, who stayed for a year in Cumberland Sound, also found the species toward the end of summer in great flocks on Kennedy Lake (Nettilling), and heard from the natives that it was said to breed on Amadjuak [lake] situated farther south (*in litt.*). Whether this statement is true, the future will tell. The birds which appear as migrants in our district might come from those regions.

Anser albifrons gambeli Hartlaub. [p. 348].
Amerikanische Bläss-Gans.—WHITE-FRONTED GOOSE.

Eskimo: *Nerdlernak*, -*ûk*, -*at* (*partim*); from *Nerdlek*=goose in general).

Apparently migrant in our district. At least, when we were stuck in the pack-ice at the entrance to Hudson Strait and in Ungava Bay at the end of July, I saw several small flocks of two to five individuals, which to all appearances belonged to this species. I was also assured by the Eskimos, that they had occasionally killed geese which corresponded to my description. Bigelow knows, to be sure, only one single oc-

³⁹ *Melanitta perspicillata* of Bent, 1925.—R.M.A.

currence of the species on the whole Labrador coast; he secured a skin of May, 1900, from Hoffenthal (1902, p. 28). During his stay in Cumberland Sound, Kumlien did not observe it himself, but believes, according to information from the Eskimos that *Anser albifrons gambeli* inhabits the larger lakes in the interior of Baffin Island in great numbers (p. 349). Were that the case, the species must probably occur in northeastern Labrador rather regularly as a migrant. Kumlien also met large flocks at the end of July, 1878, in the middle of Davis Strait (1879, p. 88). The killing of the wary geese, as well as their preparation, offers great difficulty. Identification, however, very uncertain without material before one.

Branta canadensis (L.) [*hutchinsii* (Rich.)?] [p. 349]. *Hutchin's Canadische Gans*.—HUTCHINS' GOOSE.

Eskimo: *Nerdlek*, -*lik*, -*lit* (=goose in general; Fabricius explains the name according to the Greenlandic dialect as probably derived from *neriok* = to eat, because one sees the birds almost always hunting for food, or from *nerdlerpok* = to provide with food, because the bird gives so much and such good eating [Winge, Grönlands Fugle, 1898, p. 120].).

It may probably be the smaller subspecies of the Canada Goose which visits our neighbourhood as a not rare spring and fall migrant. I got sight of a flock of four individuals only once, on 26th September, but there was such an exceed-

ingly strong southwest wind that my stalking was unsuccessful. A few days before an Eskimo had killed one, but I did not learn this until nothing was left of the bird. Whether this species breeds in northeastern Labrador is doubtful; farther south it breeds, perhaps on the whole peninsula. The breeding birds on the northeast of Ungava Bay, for example, at George River, do not appear to belong any more to *B. c. hutchinsii*, but to *B. c. candensis* (L.) [Canada Goose]. Hudson Strait is perhaps the boundary for the breeding range of both forms. Kumlien mentions Kingwah Fjord on account of a bird killed there 10th June, as a migrant, *B. hutchinsii*, and says that the Eskimo who shot the goose, had seen many birds of the kind on southwestern Baffin Island (near Nugumiut), quite near our district in Labrador (1879, p. 88). Also, a specimen collected by Crawford Noble, Jr., in Cumberland Sound, in Marschal College Museum, in Aberdeen, should belong to the smaller subspecies; length, 32½; wing, 16 inches (A. L. Thomson, *in litt.*). Payne mentions our subspecies for Prince of Wales Sound in Hudson Strait; these migrated at the beginning of September, 1885, in company with Brant and Snow Geese in great numbers (Macoun, I, p. 120). The Eskimos prize the bird most highly on account of its size and its savory flesh.

(To be continued)

NOTES AND OBSERVATIONS

A METHOD OF CLEANING LARGE BIRD SKINS.*—Last spring I received a packing box containing seven Whistling Swans. The Royal Canadian Mounted Police patrol at Kingsville, Ontario, had gathered and saved these and one other which I received on March 23rd from some twelve that had died and washed ashore from the flock of one thousand or more that stopped there on migration last spring and Mr. Jack Miner had rushed them forward by express for post mortem examination.

Although the dead birds were only in fair condition for utilization as bird skin specimens, five were skinned by me and one was turned over to the National Museum of Canada to be mounted. Mr. C. L. Patch and I found that the fine clay of the Lake Erie shore had been so ground into the feathers, doubtless by wave action after death, that it was impossible to clean them by

ordinary methods. The clay stuck tenaciously and it is possible that some tar or oil from the waters where these birds had wintered helped it to stick in place.

As I laboured over the five specimens I had undertaken to prepare, it occurred to me that mud which had been ground into feathers by wave action might be removed by the same action. The ultimate result was that the following process was tried. The birds were skinned, salted, and set aside so that they might be finished as opportunity offered. The salt was washed out with water and the skins well fleshed. Then each skin was treated for ten to fifteen minutes in a vacuum cup washing machine using warm water and soap. This was followed with three rinsings in the machine, the water was drained off the specimen, it was soaked over night in gasoline, and dried in hot hardwood sawdust, and the sawdust was removed by the blower attachment of an ordinary vacuum cleaner.

*A paper read at the 45th stated meeting of the American Ornithologists' Union, Washington, D.C., November, 1927

The washing machine forced the soap solution through the feathers and removed all the clay, and whereas the plumage was grimy and discoloured before this washing, it came through the process thoroughly clean. In spite of this apparently rough treatment practically no feathers were lost. All the equipment is that in ordinary household use.

When the process was complete the plumage was obviously in first class condition, and delicate silvery greys and faint browns in a juvenile specimen were shown clearly, although these details had been obscure or unobservable before treatment.

Do not make the mistake of using gasoline in a washing machine. A large dwelling house in Canada was recently blown to pieces and several people were killed because this was done. The cellar became filled with an explosive mixture which ignited from the machine.

The cause of death of these Swans was found by Dr. A. B. Wickware of the Health of Animals Branch of the Department of Agriculture at Ottawa, to be a heavy infestation with a liver fluke, but this is another story which will be fully told in due course.

Apparently every museum needs a washing machine.—HOYES LLOYD.

WILLIAM COUPER—A *Pioneer Canadian Entomologist*.—He first appears as author of a nature calendar for Toronto. This was published in the *Canadian Journal* for April-July, 1853, series I, Vol. II, p. 20.

Next, we hear of him living and collecting at Quebec during the 60's, and making expeditions to Labrador and Anticosti.

In 1869, he was apparently living in Ottawa and wrote an article on "Spider's Nests", which appeared in the *Canadian Entomologist*, Vol. I, p. 69. This was followed by other articles on insects.

In 1870, he was living in Montreal (*Can. Ent.* II, p. 110). The *Canadian Entomologist* for 1872 (Vol. IV, p. 179) gives an account of his experiences in Labrador, with quotations from the *Montreal Herald*.

In 1877, he published his "Notes on the Mammals of Canada" relating chiefly to Anticosti (*Forest & Stream*, June 14, 1877, p. 300).

In 1881, he appears at Montreal as editor and probably founder of the *Canadian Sportsman and Naturalist*. This was issued on the 15th of each month during 1881, 1882, and 1883. Then apparently it died. His advertisement appears on the cover: Wm. Couper, naturalist, taxidermist, 806 Craig Str., Montreal.

In 1882, his name appears on the Council of the Ontario Entomological Society.

The *Canadian Record of Science and Continuation of the Canadian Naturalist* appeared at Montreal in 1884, but the name of William Couper does not appear in it, nor in any subsequent issue.

In 1890, according to Cassino's *Naturalist Directory*, William Couper was at 518 Whipple Ave., Lansingburg, N.Y., carrying on business as a taxidermist and entomologist. In the 1892 edition of this *Directory*, his name does not appear. Thenceforth, I find no trace of him.

His origin, connections, and time and place of birth and death are not recorded. Can any reader supply these details?—ERNEST THOMPSON-SETON.

HOW DO GOLDEN-EYE DUCKS SLEEP IN WINTER?—Immediately below the Mill Bridge at Arnprior, Ontario, the current of the Madawaska is so rapid, that for a distance of two or three hundred yards the river never freezes over. This open water is occupied every winter by Golden-eye Ducks, sometimes a single bird, but often a pair, and I have seen as many as six at a time. When crossing the bridge on a below zero morning, it is indeed a chilly sight to see them diving and stemming the current, half hidden in the "frost smoke" that drifts along the surface of the water.

Now in forty years' observation only once have I seen a Golden-eye come out on the ice, and that individual died there, evidently being moribund when it left the water. The occasional Merganser that visits the rapid in winter, sometimes climbs out onto the ice; but the Golden-eye seems to rest nowhere but on the water.

The question then arises, how do the ducks sleep? Neither here nor at any other rapid throughout this part of the country are there quiet backwaters or slow eddies where the birds might float at ease; for wherever the current relaxes, the water freezes over. The only open water is necessarily running swiftly, and the ducks must keep swimming all the time or they will be carried under the ice.

It is said that ducks sleeping in the middle of a pond keep paddling slowly with one foot so as to avoid drifting ashore. I do not know if this statement has ever been authenticated, but to maintain their position in a rapid they must swim strongly with both feet. Can they do so in their sleep? Or while drifting with the current, do they sleep in short snatches of a few seconds' duration, like the seals on the ice in the Arctic? Or, as they nest in hollow trees, perhaps they

take shelter in such places on winter nights. Has anyone ever seen them entering a hollow tree in the winter? I know that sometimes they remain on the water after dark for when the electric light station near the bridge was in operation, it was not unusual to see them by the light of the old-fashioned arc lamps bobbing around on the surges.—CHARLES MACNAMARA.

A RICHARDSON'S OWL AT TORONTO.—When strolling through a small wooded ravine in High Park about 10.30 a.m. on November 6th, 1927, the writer's attention was attracted by the excited chirpings of Juncos and Chickadees. Peering through 8X binoculars in the direction from which the notes came a small Owl was discerned perched in a white cedar tree approximately five feet above the ground. The site chosen by this fellow was indeed an ideal one in many respects, except for the fact that the sun shone through an opening in the trees directly in his face (a very uncomfortable position for a crepuscular bird) his eyes blinking in characteristic Owl fashion. When first viewed from a distance of 40 feet, the bird was taken for a Saw-Whet Owl, but a closer approach revealed a noticeably larger bird than the average Saw-Whet. Moreover, there were round white spots quite prominently visible on the crown of the head which suggested Richardson's Owl.

The next step was to capture the stranger and make his identity certain. This was accomplished with the aid of a young chap and a butterfly net. Approaching our unsuspecting victim from opposite sides it was possible to get within four feet of him, by advancing a step or two whenever the Owl turned to look in the opposite direction. We gently placed the net over his head and captured the bird without the slightest trouble.

At the next meeting of the Brodie Club held in the Royal Ontario Museum of Zoology, the Owl was exhibited to the members who unhesitatingly declared it to be none other than Richardson's Owl. The last specimen taken at Toronto was in the year 1910,* and it has always been regarded as one of the rarest Owls in Eastern Canada.

Our visitor is being kept alive in a large box for the purpose of studying his habits and notes, but up to the time of writing (January 10th) no sounds have been heard nor has anything unusual concerning his habits been noticed.

This particular specimen seems to prefer mice to birds as an article of diet. One evening two

English Sparrows were placed in the Owl's cage. We expected to find only a few feathers the following night, but on peering into the cage we saw both sparrows alive and healthy, although there was nothing else in the cage for the Owl to eat. Two live meadow voles (*Microtus*) were then placed in the cage to keep the sparrows company but their career was short-lived. The Owl must have had a merry time this second night for all there was to be seen on our next visit was one sparrow minus a head and a few tell-tale feathers strewn about on the floor of the cage. It would seem, therefore, as if mice held first place in this Owl's bill of fare, and when these were not forthcoming, birds were acceptable. It seems satisfied with two mice daily and when these are not available will eat raw beef.

This specimen seems to be much more active early in the evening than later. On rainy days he appears quite active, and on fine days very quiet. His eyesight is unusually poor in the daylight, and he seems to follow movements in his cage more by sound, apparently, than by any other means. When disturbed or frightened he has a peculiar habit of swaying sideways on his perch, shifting his weight quickly from one foot to the other. He also has a peculiar habit in the evening of climbing parrot fashion around the wire front of his cage, hoping, perhaps, to regain his freedom in the great out-of-doors.

It is said that in Northern Alaska where this species is not uncommon, the Eskimos frequently capture these Owls alive by simply picking them off the branches, and keep them as pets around their dwellings. They have given the bird an unpronounceable name, which means in English "The Blind One", due to its defective eyesight in the daytime.—ROBT. V. LINDSAY

TWO RECORDS OF WARBLERS AT TORONTO IN WINTER.—On Christmas Day, 1927, a male Maryland Yellow-throat (*Geothlypis t. trichas*) was located in a dense alder thicket in High Park, Toronto, in company with a flock of Tree Sparrows and Chickadees. This bird was kept under close observation for half an hour, permitting four members of the Brodie Club to obtain splendid views to their entire satisfaction. The bird seemed quite lively and appeared to be in good condition, and although several return trips were made to the same locality, it was not seen again.

On January 1st, 1928, in High Park, the writer observed a Palm Warbler, (*Dendroica p. palmarum*) associating with a flock of Chickadees, several close-up views of the bird were obtained, the

*J. H. Fleming, *Auk*, April, 1913.

characteristic tail-tipping, pale yellowish-white underparts (faintly streaked), bright yellow under tail coverts, etc., were carefully noted. The bird showed no apparent indication of weakness or disability, and appeared to be in perfect condition.

On January 8th, Mr. C. Hope accompanied the writer to High Park in an endeavour to find either the Maryland Yellow-throat, or the Palm Warbler again. By a mere coincidence we discovered the Palm Warbler in the same place as the Maryland Yellow-throat had been seen on December 25th. Again it was found associating with Chickadees. Due probably to the unusually mild winter to date and to the surprising lack of snow in the Toronto region, it is possible for these warblers to subsist on scanty fare, but if colder weather sets in accompanied by very much snow, it is a question if they will survive. It is a noteworthy event that Toronto has escaped the heavy falls of snow that have occurred both to the north and south this winter. The abundance of winter birds in High Park, in contrast to the scarcity and total absence of certain species a year ago was very apparent.

Mr. W. E. Saunders of London, Ontario, informs me that he has not heard of any instances of members of this family spending the winter in this province, prior to the above.—ROBT. V. LINDSAY.

SUCCESS ON A SANCTUARY.—Frequently one reads of the disasters which lurk in wait for our native birds in the nesting season and there can be no doubt that these are real dangers which often have a very serious influence on the number of young raised during the summer.

The enthusiasm for nest hunting on the part of my grand-daughter, Nora Fetherston, visiting them every few days, and noting progress, has provided the following figures which indicate the amount of success obtained by the birds on my sanctuary during the present season.

Three Robins' nests successfully fledged twelve young. All of these were against buildings and two sets of eggs were laid in the same identical nest against the cottage. A Catbird laid four eggs, one of which vanished but three young ones were fledged. A Song Sparrow's nest in the shrubbery beside the cottage apparently escaped the vigilant eye of the Catbird and the four eggs were hatched and the young duly fledged. A Brown Thrasher came nearby for her second laying and when the nest was found she had only two eggs and later on two young flew from the nest. One Meadow-lark's nest had four eggs and another one five, one of which failed to hatch

and from each of these nests four young Meadow-larks flew.

The only casualty was the nest of a Meadow-lark which had four eggs and the young were lost from the nest a few days after hatching.

This gives a total of thirty-four eggs laid, thirty-three eggs hatched, and twenty-nine young fledged, which is a much higher percentage than one might have expected.—W. E. SAUNDERS.

NOTES ON RUDDY DUCK.—On Friday, July 6, one of our party saw a duck fly into the bulrushes at our Sanctuary, but it was not identified. Two days later however, a Ruddy Duck with brilliant cheek patch swam across the middle of the pond and after a while swam back again. This is a new mid-summer bird for London, as our list of summer stragglers has not previously included the Ruddy.—W. E. SAUNDERS.

THE AMERICAN EGRET (?) IN WELLAND COUNTY.—On August 15, 1928, a party of six set out to investigate the fauna and flora of the peat marsh which comprises about one-fifth of the area of Wamfleet Township.

We were approaching the edge of the marsh when a large white bird flew up from a drainage ditch near some reclaimed land. We knew at once it was something out of the ordinary. It was about three-quarters the size of the Great Blue Heron and pure white in colour, with the exception of black legs and yellow bill. It flew about a hundred yards, then lit on a bare field where we all had a good look at it with field glasses. It again took wing and lit once more before flying away for good. The neck was folded against the breast in flight.

From our leisurely observation of the bird and consultation of a pocket ornithological book, there seemed to be little doubt as to the identity of the bird as an American Egret. No plumes were visible however.

This peat marsh is quite a sanctuary for wild life and still probably harbours some rattlesnakes. I saw a small specimen there in June, 1927.—W. E. HURLBURT.

RE OFFICIAL CANADIAN RECORD OF BIRD BANDING RETURNS.—I beg to call attention to an error in one of the band numbers of the Official Canadian Record of Bird Banding Returns as published in the September, 1928, number of *The Canadian Field-Naturalist*. The first return appearing on page 157, is given for Mallard No. 431,945, while it should be given for Mallard No. 421,945.—HOYES LLOYD.

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No. 9

A CRUSTACEAN NEW TO THE PLEISTOCENE FAUNA OF CANADA

By E. M. KINDLE.

THE ISOPOD crustacean genus *Mesidotea* includes two marine species with a circumpolar distribution which are of considerable interest to geologists concerned with the Pleistocene history of northern Europe and America. One of these, *Mesidotea entomon*, is found in Lakes Venern and Vettern in Sweden where its presence is explained as a result of communication between the Baltic and North and White Seas having been interrupted in late glacial times by a rising of the land in Scandinavia². In the resulting brackish Ancylus Sea *M. entomon* survived and in its freshwater successors, Lakes Venern and Vettern, still survives as a relict species although it is elsewhere normally a marine form. The other species *M. sabinei* is also found in Sweden³ as a fossil in the clay of the "Yoldia Sea" where it contributes to the evidence of Arctic conditions prevailing at the time of the deposition of these sediments.

Both of these crustaceans are known from the marine fauna of Labrador,⁴ but neither has heretofore been recognized on this side of the Atlantic in the Pleistocene fauna. Recently Brother Alphonse F.E.C. of Ottawa, presented to the National Museum a fossil crustacean which has been identified as *Mesidotea sabinei*. The specimen forms the nucleus of a concretion which has the same physical characteristics as the concretions of the Ottawa district which often enclose the fish *Mallotus villosus*⁵ and represents the same horizon.

¹ Published with the permission of the Director, Geological Survey of Canada.

² A. G. Nothorst: "Sweden's Quaternary Deposits", pp. 166-169, 1894. The writer is indebted to Mr. Frits Johansen for a translation of parts of this work.

³ A. G. Nothorst: "Sweden's Quaternary Deposits," p. 162.

⁴ P. T. Boone: Crustacea, Can. Arctic Exped. Rept. Vol. 7P & D, pp. 19-23, 1920.

⁵ Figures of this and most of the other marine Pleistocene fossils of the St. Lawrence basin may be found in Sir J. Wm. Dawson's "The Canadian Ice Age", Montreal, 1893, pp. 206-271; The Post Pliocene geology of Canada: Can. Nat., Vol. 6, 1872, pp. 19-42, 166-187, 242-259, 369-416. See also H. M. Ami: Classified list of fossils from Ottawa and vicinity. Trans. Ottawa Field Naturalists' Club, No. 5, pp. 9-10, 1884. List of fossils to accompany report by Dr. R. W. Ellis on the City of Ottawa map, Annual report Geol. Surv. Can., New Series, vol. 12, pp. 51G-56G, 1901. E. M. Kindle Range and distribution of certain types of Pleistocene concretions, Bull. Geol. Soc. Am., vol. 34, pp. 609-648, pl. 8, 1923.

This fish, which is known to fishermen as the caplin, has at present a boreo-arctic and circumpolar distribution. It is not found in numbers south of Trondhjemfjord on the Norwegian coast. Along the east coast of North America the caplin ranges as far south as Cape Cod. Along the Newfoundland and Labrador coasts it is exceedingly common but it is not abundant south of Halifax. In a recent paper, Dr. St. J. Bolkey of Sarajeno reports finding in S.E. Bosnia a fossil caplin at an elevation of 580 metres above the sea.⁶ This appears to extend the Pleistocene range of the *M. villosus* fauna in Europe more than 1000 miles south of its present southern limit on the Norway coast.

The specimen figured here was discovered by Brother Alphonse F.E.C., east of Ottawa on the bank of the Ottawa river a few hundred yards below the Rifle Range. The specimen corresponds with *Mesidotea sabinei* in its long slender body, the ratio of breadth to length giving an index figure of 3.4 while in specimens of *M. entomon* from Alaska the breadth to length index is 2.7. The anterior pair of antennæ are missing in the fossil but the second pair are well preserved. In both *M. entomon* and *M. sabinei* the size of the antennæ is abruptly reduced after the fourth segment but its reduction is very much more abrupt in *M. sabinei* and is rather sharply contrasted with *M. entomon*. The fossil shows no trace of the legs corresponding in this respect to most trilobites.

Johansen states (quoted by Boone) that *Mesidotea* is adapted to live in water of various degrees of salinity or non-salinity, "often ascending creeks to lakes".⁷ This characteristic of great adaptability fitted *M. sabinei* to live in the more or less brackish Pleistocene arm of the sea which furnished the fossil specimen here figured.

The known species which comprise the Ottawa valley Pleistocene fauna west of Montreal are all forms which can adjust themselves to a rather

⁶ E. Loennberg: *Mallotus villosus* found as fossil in Bosnia ("Flora och Fauna", Upsala, Vol. 21, 1926, pp. 45-46).

⁷ *Op. cit.*, page 22D.



FIGURE: *Mesidotea sabinei*. Natural size. The figure shows the outline of the concretion in the centre of which this crustacean was found.

wide range of salinity. *Macoma balthica* which is probably the most common fossil in the Ottawa valley finds its normal habitat in the brackish waters of the Baltic Sea. This shell and its associates indicate for the Ottawa valley arm of the Pleistocene sea in which they lived a moderate degree of salinity, comparable with that of the upper Baltic of the present. Gastropods are rare in this fauna. Such typical marine creatures as sea urchins are wanting also. Brachiopods which require water of ordinary marine salinity are unknown in the Pleistocene deposits of the Ottawa valley. The relatively small number of species known from the Ottawa valley facies as compared with the considerable number known in the lower St. Lawrence basin clearly points toward the unfavourable low salinity conditions of the former for typical marine creatures. In Ami's lists of the Ottawa Pleistocene the mol-

lusca are represented by only 40 species while in the lower St. Lawrence region Dawson found 340 species in this fauna. In its arctic and sub-arctic range *M. entomon* affords evidence supplementing that of *Saxicava arctica*, *Portlandia glacialis* (Wood) (*P. arctica*) and others of the molluscan fauna with which it is associated in suggesting climatic conditions approximating those of the Ottawa valley marine clays. *Portlandia glacialis* which is such a characteristic fossil in the Pleistocene clays of Eastern Canada has not been found south of the Strait of Belle Isle according to Whiteaves. *Saxicava rugosa* is a characteristic Arctic shell, though having a considerable southern range. The writer found it in such abundance as to nearly exclude other species in lat. 74.15 West Greenland on a mud bottom in front of Cornell glacier.

LANDSLIDES IN CANADA¹

By D. A. NICHOLS

THIS PAPER deals with the occurrence and causes of landslides in Canada, and is based on observations by the writer and other field officers of the Geological Survey of Canada.

A landslide is the sliding or falling of a mass of earth or rock from its original position to a new one. It may occur as a smooth and easy downward and outward movement or slumping of soil or debris, or, as a violent and sudden one. It may occur as a movement along a bedding plane or as a splitting off of a huge mass from a cliff face transversely to the bedding plane.

Landslides of great magnitude generally occur in mountainous areas. However, extensive slides also occur in places of low relief, and are, perhaps, of greater human interest, for they frequently destroy buildings, roads, bridges, dams and other engineering structures. They are characteristic of youthful stream development, particularly in areas underlain by unconsolidated materials such as clays, sands or silts. At this stage of development, the stream begins to widen its valley by lateral erosion, the banks are undercut and land-

¹ Published with the permission of the Director, Geological Survey of Canada.

slides occur, often producing overnight almost as much change as does several years of normal rain erosion or frost creep. Although the magnitude and frequency of occurrence of slides is greatest at this period of stream development, they persist into maturity and beyond when conditions are favourable.

In alpine areas, landslides occur where the extremes of heat and cold, in conjunction with incompetent or tilted strata favour the disruption of rocks.

Landslides may be grouped under several headings,—

1. Slides due to slipping of surface material over stationary substratum.
2. Slides due to movement of materials in a substratum.
3. Slides due to movements at right angles to, or inclined to, the substratum.
4. Slides due to mining or other excavations made by man.

A common cause of landslides is the saturation of the ground as a result of excessive rainfall. Where there is a somewhat impervious layer overlain by a more permeable one, the groundwaters collect just above the impervious layer and act as a lubricant which greatly assists the gravitative movement of the mass. This movement may be started by earthquakes, frost action, the readjustment of stresses within the material, or by the works of man. Conditions favourable to the occurrence of the slide may exist for a long time, and yet no movement take place until some unusual event precipitates it.

Along the rivers of Ontario and Quebec, throughout the areas once occupied by the glacial lakes and the Champlain sea, landslides are of frequent occurrence, for there, the streams are in a youthful stage of development, and generally flow through unconsolidated material.

About April 20th, 1927, a landslide occurred on the Blanche river, one and one half miles north of Wawbewawa, Timiskaming district, Ontario. At a small fall on the river, the varved clay deposit of the east bank of the stream slid out, leaving the striated rock surface exposed, and the river migrated easterly to flow for several hundred feet in an old channel excavated in bed rock. (View 3). The stream also shifted laterally 300 feet, in some places cleaning out the entire varved clay deposit; in others, leaving large masses of clay stranded on the sides of the old channel. (View 1). On the east side of the stream are banks of varved clay 60 to 80 feet high. On the west side is a landslide scar and an irregular terrace of hummocks typical of landslide topo-

graphy, showing that movements have occurred there antedating the one of April, 1927.

The old rock channel disappears under the clay banks of the east side of the stream, and the river forms an eddy at a sharp bend around the foot of the bluffs where masses of clay were still falling on May 17th when the site of the slide was visited. Eventually, this bluff will be undermined and the river will seek the old rock channel which underlies it.

The clay in the bluffs is distinctly varved horizontally, but near its base there are contorted zones, probably due to slumping. At the contact with the underlying rock, the laminae feather out and partly conform to the irregularities of the rock surface. (View 4).

Previous to the slide, the river flowed over the clays to one side of a buried rock channel, and fell over a knob of the old uneven surface. (View 3). This unevenness caused the river to erode to the east where the rock surface stood lower. A cribwork, for diverting logs over the fall, dammed back the water, thus superimposing extra weight on the clays above the fall and causing erosion of the clay banks at the side of the cribwork which was built at a sharp bend in the river. The stream, especially at flood time, impinged on the clay banks on the east or slip-off side of the buried depression, undercutting them at a critical point. These conditions added to the saturation of silty layers in the clay or the lubrication of the underlying polished rock surface disturbed the equilibrium of the mass which eventually slid out downstream.

On the same river, there are evidences of other landslides, in fact, they are common. About three miles east of Englehart, in the township of Evanturel, another slide was visited, where an area several hundred feet long and about 350 feet wide slide into the Blanche river destroying a bridge and a part of the highway, and engulfing a wagon which was being driven across the area at the time of the catastrophe. The driver of the vehicle escaped. Here, as at Wabewawa, evidences of an ancient slide are visible. From near the edge of the slide, a gully, with hummocky topography, joins the Blanche river with a distinct upstream barb, an indication of faulting. (View 6).

This slide dammed the river, backing up the water for a mile or more until the river excavated a new channel for itself. The present road passes down from the upper terrace to the slide, which it crosses to the bridge spanning the river. The bridge is built on piling driven to a depth of 40 feet in clay, bed rock not being reached. The

bridge seems to be in a rather dangerous location, as slides may again occur due to the unstable condition of the slide material, portions of which were being undermined and dropping off a few yards from the bridge while the site was being examined.

The cause of the Englehart slide appears to be the saturation of the silty layers of the varved clays. These layers attain a semi-liquid condition and greatly increased weight at times of undue rainfall, so that very little undercutting of the banks precipitates the movement of the unstable mass which either flows out like a liquid or faults down in step-like masses. These step-faults are clearly shown in View 6.

Another slide of more disastrous character is described by Ells, (11). This occurred on April 16th, 1908, at Notre Dame de la Salette on the Lievre river, Quebec. This slide, while of no great dimensions, involved a great loss of life and property. It extended for about 1300 feet, with a width of 400 feet along a clay bank which rose about 60 feet above the river.

At the site of the slide, a fissure developed about 200 to 300 feet back from the river. Into this the spring run-off descended and reached an inclined stratum of clay which dipped towards the river. This became lubricated and the over-weighted sands, silts and clay precipitated themselves into the river which was frozen at the time. The rush of soil, ice and water was carried up over the opposite banks of the river, across the village of Notre Dame de la Salette, overwhelming the village and carrying the demolished buildings a considerable distance inland to a height of 50 feet above the bed of the stream. The backwash from the flood, again swept over the village removing a great deal of the debris and carrying it downstream. Twelve houses and twenty-five outbuildings were demolished with a loss of thirty-three lives. A clay dam was thrown across the river, backing up the water for some distance causing considerable property damage upstream. Eventually, the dam was swept away and the river regained its old channel. Owing to the unstable and tilted condition of the clays of this locality a recurrence of such slides is probable. There is indication of ancient slides in the vicinity as is shown by the hummocky topography and by the presence of trees partly buried in the clays.

Previous to the Salette catastrophe, there had occurred a slide at Poupore on the Lievre river. Here, an area of about 95 acres of clay slid into the river damming it up to the locks about a mile upstream. The slide was in undisturbed clays.

A slide of somewhat different character occurred on the Riviere Blanche, Portneuf county, near St. Thuribe on May 7th, 1898, destroying three farm buildings and with the loss of one life.

The movement started first on the 6th of May, in a small hollow from which a tiny stream trickled. Early in the morning of the 7th, the movement began to accelerate, gradually gathering force and continuing for about three hours. An irregular chasm was formed with its narrow mouth towards the river. This extended inland 1800 feet widening gradually to a maximum of 1800 feet, with a depth of 28 feet. Through this channel, a soft fluid material flowed out into the river, carrying with it huge blocks of the more coherent clays, while large masses were left stranded on the bottom of the depression, in all sorts of attitudes. As in many other instances, evidences of ancient slides were noticeable in the vicinity.

On October 11th, 1903, another slide of considerable extent occurred on the Lievre river not far from Buckingham village. For several days preceding the movement there were heavy rains. On a small tributary, water was seen issuing from the sides of the gully. Suddenly, a large area of clay, which had become saturated, slid into the river, passed across its bed and up the east banks which were 20 to 30 feet high, carrying away a portion of the highway which crossed the area. Large islands of clay, 4 to 5 acres in extent were moved bodily and rested intact with crevasses of 15 to 18 feet in depth surrounding them. The stream was temporarily dammed.

The immediate cause was similar to that of most of the movements in the clay deposits. A silty layer, about 20 feet below the surface became saturated and lubricated so that the super-incumbent mass moved bodily forward with disastrous results.

Along the St. Maurice river and its tributaries numerous slides have been recorded, several of great intensity. Below Shawinigan, at Matteau farm, a block of farmland, 900 feet by 450 feet settled about 30 feet making a sharp slide scar where once was level farmland. The material flowed out like water and drained through a gully into the St. Maurice. The area is underlain by laminated clay, silt and sand which had become saturated by long continued rains.

Records of slides are not restricted to the clay belt of eastern Canada. In the alluvial areas of the west and in the alpine areas numerous records of slides have been made.

In October, 1881, a few miles above Ashcroft, B.C., about 150 acres of benchland, 2000 feet wide sank about 400 feet sliding laterally about

1000 feet, crossing the Thompson river and filling the valley to a depth of 160 feet. The river was so completely dammed that persons were able to cross dryshod below the dam. The river soon swept this away, causing heavy floods downstream.

At Spences Bridge, B.C., just below the town, on August 13th, 1905, an alluvial bluff slid into the river filling it to a depth of ten to fifteen feet, carrying away the Rancherie, an Indian village, killing twenty Indians, injuring thirteen others and causing considerable property damage.

On February 23th, 1903, a mass of rock broke away from a precipice on the northeast arm of Arrow lake, two miles from Arrowhead. It slid down a narrow draw into the lake forming a rock fan. The lake was frozen over at the time, and the debris broke through the ice forming waves 6 feet high which threw a tug up on the shore and drew it back three times. The rock mass had become unstable due to atmospheric agencies and the tremors of 1901. The heavy accumulation of snow during the preceding winter months may have caused its final disruption and the slide resulted. Several other slides have been noted in the same district.

Perhaps the most disastrous landslide in Canada was the one which occurred at Frank, Alta., on April 29th, 1903. This slide occasioned the loss of about seventy lives and immense property damage. The greater part of the town was wiped out, together with about 7000 feet of the Crows Nest railway.

Turtle mountain from which the slide fell has an altitude of 7204 feet, the town of Frank, 4200. The mountain consists of a base of shale interbedded with sandstones and coal seams, all standing nearly vertically. A steeply inclined thrust-fault plane, dipping into the mountain, separates these from an overlying series of strongly jointed limestones with two very intricately contorted zones near the base. The limestones dip steeply into the mountain, whose cliff face varies from 13 to 67 degrees with strong overhangs in many places. (View 8).

A huge mass, nearly half a mile square, of the upper part of the mountain, suddenly precipitated itself to the valley beneath, crossing the Crowsnest river at about an elevation of 4150 feet, and continuing its course across a terrace bordering the river, flowed up over a cliff to an elevation of 4550 feet at a distance of 1.8 miles from the crest of the mountain. It also spread laterally in a series of lobes, the greatest width being approximately 1 mile.

At the base of the terrace it was turned laterally, being diverted along the cliff face. The

front of the slide farthest from the mountain presents the appearance of a huge congealed rock wave, with a very definite clearly marked edge. There are few isolated pieces of rock away from the edge. (View 9).

A remarkable ridge, parallel with the face of the slide, appears about halfway across the debris, and seems to represent the face of a second slide, which immediately followed the first, but did not travel so far. It is along the depression between this ridge and the main slide that it was possible to rebuild the railway, although the grade is very heavy.

The material of the debris consists of fragments of all sizes from extremely small ones to masses of 40 feet or more, the largest being a huge rock 70 feet long. The blocks are scattered about in numerous small ridges with intervening depressions, the whole simulating ground moraine topography. On most of the large blocks, there are small stones and tiny rock fragments balanced precariously as if placed there by hand. (View 10).

On the western side of the slide, there is a series of peculiar conical rock heaps, some of those examined containing a huge boulder as nucleus. These cones are from one foot to several feet in height. (View 11).

The immediate causes of the slide were:—

1. The unstable base of the mountain with its thrust plane and contorted incompetent zones.
2. The strongly jointed condition of the limestones.
3. Internal stresses inherent from the original thrusting and folding.
4. Jars caused by the 1901 earthquake and from mining operations at the base of the mountain.
5. The weakening of the base of the mountain by the removal of the coal.
6. Intense atmospheric agencies operating on the summits; rapid contraction and expansion of the rocks and the prying action due to freezing of water in the joint planes. While surveying the slide area in 1912 it was noticeable every day, that soon after the morning sun struck the face of the mountain small slides were precipitated from the summit of the mountain.

The above causes all had a cumulative effect, until equilibrium was overcome and the unstable mass precipitated itself valleyward.

There are numerous slides similar to the Frank one but less disastrous in nature, in many places in the front ranges of the Canadian Rockies. Rock streams and rock glaciers are common

features at the base of many cliffs and in abandoned glacial cirques.

Landslips of small extent, but numerous are met with along the banks of the streams crossing the Foothills of Alberta. The streams are all deeply entrenched through glacial and fluvial material into the solid rock below. The overburden of unconsolidated material is constantly faulting down where streams issue at the contact with the underlying rock.

On the Ghost river, a few miles above its mouth, in the spring of 1927, a slide partly dammed the frozen river. The great rush of water, when finally released, roared down the river carrying ice before it and scoring the sides of the canyon in several places.

Many other slides might be described, but those mentioned suffice to illustrate their common characteristics. A bibliography which includes most of the important Canadian occurrences is listed below.

The main fundamental causes of landslides are as follows:—

1. Undermining of the banks of youthful rivers by lateral erosion.
2. Oversteeping of mountain slopes.
3. The incompetence of some underlying beds, and jointed areas.
4. Lubrication of silty layers in clay beds or along the rock contacts allowing the superincumbent beds to slide out.
5. The effect of weathering agencies such as frost, rain, etc.
6. Accumulated stresses inherent in folded and faulted areas.
7. Earthquakes.
8. Artificial conditions such as mining, etc.

The most important, and perhaps final cause of all landslides is possibly the weakening of the rocks by ground waters and atmospheric agencies. These are continuously operating, and conditions for slides only require some excessive amount of groundwater or some slight tremor to start the movement of the unstable mass.

From a study of slides, especially of those in

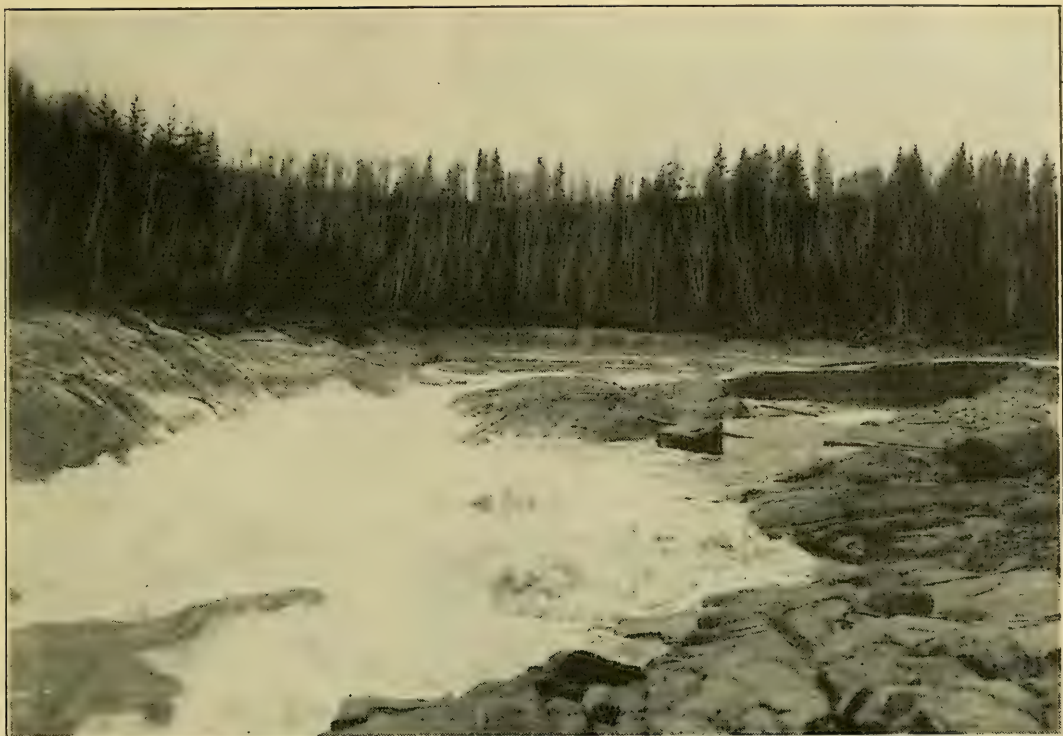
areas where mining operations or engineering works are being established or in the clay belt where dams, bridges or power houses are being constructed, a careful examination of the conditions and general topography of the vicinity should precede any such undertaking.

Interlaminated silts and clay provide favourable conditions for slides. Clays or gravels, or smooth bed rock contact are particularly treacherous; unusual precipitation should be watched; the effect of earth tremors should be noted; in fact geological and meteorological knowledge should be taken into consideration in any large engineering projects in areas where these are to be undertaken.

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VIEW 1.



VIEW 2.

View 1 shows the preglacial channel of the Blanche river excavated in granite-gneiss. This channel was filled with glacial varved clays which slid out causing the slide of April, 1927.

View 2 taken from the same point, looking upstream shows the position of the present falls located on bed rock 1000 feet upstream from the position of the old falls.



VIEW 3.



VIEW 4.

View 3, looking downstream shows the debris of varved clay piled on the side of the pre-glacial channel. The horizontal line shows the pre-slide river level. Near the arrow was a cribwork for diverting logs into the main channel of the river.

View 4 shows the laminated clays that formed the bed of the river. They are much distorted in place due to movement during the slide or to gentle long continued movement preceding the actual slide. To the right is an old channel in the clays now filled with silt and logs.



VIEW 5.



VIEW 6.

View 5 looking upstream at the Wawbewawa slide shows the varved clay debris on the bed of the old stream. To the right are banks of clay, 60 to 80 feet high, that are in immediate danger of sliding as the stream is undercutting on the banks at a sharp bend in the stream.

View 6 shows a landslide on the Blanche river about 3 miles east of Englehart where a bridge and several hundred feet of road were destroyed.



VIEW 7.

View 7—View of landslide scar and debris at Turtle mountain, Frank, Alta. Turtle mountain elevation is 7202 feet, the base of the mountain about 4150.



VIEW 8.

VIEW 9.

View 8 shows the angle of slope of the face of Turtle mountain, and some of the boulders perched on the slope. The rocks where the plane table is shown dropped to the valley below, a few days after the view was taken.

View 9 shows a large boulder at the edge of the slide.

CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA OF NORTH-EASTERN LABRADOR

By BERNHARD HANTZSCH

"Beitrag zur Kenntnis der Vogelwelt des nordöstlichsten-Labradors," von Bernhard Hantzsch, *Journal für Ornithologie*, Sechsfundzigster Jahrgang (56th annual publication), No. 2, April, 1908, and No. 3, July, 1908. Leipzig. I. Allgemeiner Teil (General Part), pages 175-202. II. Besonderer Teil (Detailed Part), pages 307-392.

(Translated from the original German text in the Emma Shearer Wood Library of Ornithology, Library of McGill University, Montreal, by M. B. A. Anderson, M.A., and R. M. Anderson, Ph.D., Ottawa, 1927.

(Continued from page 207)

Branta bernicla glaucogaster (Brehm)⁴⁰
[p. 349]. *Ringel-gans*.—BRANT.

Not rare migrant, often in considerable flocks. At Killinek, I observed five individuals, apparently (p. 350) old and young, on 16th September, as well as two old individuals with white under parts on 24th September. To be sure, this shy bird, which generally keeps at considerable distance from shore, is not frequently killed. Kumlien did not observe the species, perhaps by chance, in Cumberland Sound district, although Crawford Noble, Jr., collected it there and a specimen is in the Marischal College Museum in Aberdeen (*in litt.*). Payne met it in Prince of Wales Sound, Hudson Strait, at the beginning of September, 1885, in company with Hutchins Geese and Snow Geese (Macoun, I, p. 120). Bigelow secured a specimen killed at Nain, northeastern Labrador, in October, 1899 (1902, p. 28).

NOTE: It is to be assumed that species of the Family Anatidæ other than those mentioned, occasionally appear in our district, which has been so little explored, for example, *Chaulelasmus streperus* [Bald-pate], *Querquedula discors* [Blue-winged Teal], *Mareca penelope* [European Widgeon], *Charitonetta albeola* [Bufflehead], *Erismatura jamaicensis* [Ruddy Duck], etc., as also *Olor* [Cygnus] *columbianus* [Whistling Swan] and *Branta leuopsis* [Barnacle Goose], of which latter species Moeschler offered for sale a specimen from northeastern Labrador in his catalogue of Jan. 3, 1871.

Crymophilus fulicarius (L.)⁴¹ [p. 350].
Breitschnäbliger Wassertreter.—RED PHALAROPE.

Eskimo: *Savgak*, -*gāk*, -*gat* (partim), with the people of the southeast of Ungava Bay as well as in Greenland, *Kajok*, -*jāk*, *jut* (=the red one).

Rather frequent migrant, especially in the springtime, according to the statements of the inhabitants. I observed different individuals

only at the end of July, and the beginning of August, on open places between the ice-cakes; later I did not see any. Turner says that on migration the birds appeared in great numbers on the coasts of Hudson Strait, even if only a few bred there (1886, p. 284). In the most south-eastern portion of Baffin Island, very near our district, according to Kumlien's investigations, they are said to appear very frequently and also apparently to breed in places in great numbers (1879, p. 86). In our region the birds would not settle down in large numbers on account of the steep, rocky coasts. The fact of their breeding now and then may be accepted with certainty.

One skin in my collection from Rama, female adult, apparently breeding bird of June, 1902, shows the following measurements: Wing: 134 mm. Tail: 79. Bill: 22.5. Tarsi: 20. Middle toe including the 2 mm. long claw: 21 mm.

These graceful, light-moving phalaropes are well-known to the inhabitants. When the birds swim about confidently, with nodding heads, they are scarcely to be confused with any other species. On the other hand, when they hurry through the air in hasty flight and at the same time utter their short *Gū*, *Sū*, *Zū* calls, it is not so easy to distinguish them from their (p. 351) smaller relatives. In summer plumage the red-brown under parts of course make them distinguishable. As a rule the natives do not shoot these little sand-piper species; they would have to meet a very closely-sitting flock or else have bagged no other game.

Phalaropus lobatus (L.)⁴² [p. 351].
Schmalschnäbliger Wassertreter.—NORTHERN PHALAROPE.

Eskimo: *Savgak*, -*gāk*, -*gat* (partim); with the people of the southeast of Ungava Bay, *Aivigiak* (*Aiveriak*), -*ak*, -*at* (etymology of both names not clear.)⁴³

A not very abundant migrant, rarer than *Crymophilus*; according to report of the natives almost always observed only in spring. I merely saw a single individual once myself on 22nd July rather far from the coast. Our district seems to be too rocky for this bird. Yet it is said to resort to localities suitable for breeding

⁴² *Lobipes lobatus* (Linnaeus) of A.O.U. Check-List, 1910.—R.M.A.

⁴³ The latter name is perhaps derived from *Aivik*—walrus. In the Western Arctic this species as well as the preceding species is often called "Bowhead Bird," on account of being commonly found on the whaling grounds after the breeding season of the birds.—R.M.A.

⁴⁰ *B. b. glaucogastra* (Brehm) of A. O. U. Check-List, 1910.—R.M.A.

⁴¹ *Phalaropus fulicarius* (Linnaeus) of A.O.U. Check-List, 1910.—R.M.A.

here and there, namely freshwater lakes surrounded by grass and on flat islands by the shore, in small numbers or in isolated pairs. Turner says the bird was common along the northern coast of Labrador. This perhaps applies more to the flatter districts west from the east coast. He also found them breeding on small islands in Ungava Bay (Macoun, I, p. 146). Kumlien calls them not rare, but still not nearly as common in Cumberland Sound district as the preceding.

A breeding pair in my collection from Rama, 1st July, 1907, male and female, show the following measurements: Wing: 106.5; 112.5 mm. Tail: 57, 52 (incomplete). Bill: 22; 23. Tarsi: 19.5; 20. Middle toe including the 2.8 and 2 mm. long claws respectively: 21 mm.

NOTE: *Gallinago gallinago delicata* (Ord)⁴⁴ [Wilson Snipe], Eskimo: *Otototajok*, from the voice, appears to fly exceptionally from the south of Ungava Bay to our district. Yet a confusion with a similar species is possible. According to Missionary Perrett, the bird breeds in northeastern Labrador regularly only southward from Hopedale.

Tringa canutus L.⁴⁵. [p. 351]. *Islandischer Strandläufer*.—KNOT.

Eskimo: *Tállik*, *-lĭk*, *-lĭt* (partim); perhaps from the voice.

Apparently only a rare migrant. I observed on 22nd July a flock of 20-25 birds in summer plumage, which I recognized as this species by the colouring of the head and the dark bill. It is worthy of mention that the swarm flew from the land, directed their course toward our ship, flying rather close to it, and then flew away (p. 352) in a straight line toward Greenland. On 24th July and 1st August, I once more observed two birds each day on ice-cakes in Ungava Bay. Apparently it was here a case of non-breeding younger birds, or perhaps even birds disturbed in the affairs of breeding. Kumlien only once saw a small flock passing by on Cumberland Sound, in November, 1877 (1879, p. 87). My information from the natives makes it appear that this species seldom occurs to their knowledge.

Arquatella maritima maritima (Brünn). [p. 352]. *Meeres-Strandläufer*.—PURPLE SAND-PIPER.

Eskimo: *Tállik*, *-lĭk*, *-lĭt* (partim); probably after the voice, as v. Schubert's well-informed

missionary also believed; it may not have any connection with *Tullik* = *Urinator imber* [Loon]).

Rather abundant visitor and migrant, but apparently breeding only in slight numbers on flat coastal islands and farther in the interior. As long as a strip of coast remains only a little open, this strongly-built bird remains in the country, and appears just as early in the spring again. Whether it occasionally spends the winter also, I could not ascertain, but this is in no way improbable.

5 males in my collection, collected in September at Killinek, show the following measurements: Weight in the flesh: 64-75 g. (7 females, at the very same place), 75-84 g. Total length: 206-215 (218-232) mm. Spread of wing: 380-400 (408-412). Wing: 115-124 (122-129). Tail: 64-69 (68-71). Bill: 28.5-30.5 (33-36). Tarsi: 22-23 (22.5-24). Middle toe including the 5 (4.5-6) mm. long claw: 25-27 (26-27) mm. The measurements depending on conditions of plumage are incomplete, because all the birds were far advanced in moulting. At the beginning of September the steering feathers of the tails were lacking, but the largest wing quills were present; from 17th September on, the tail had almost completely renewed itself, the first two wing quills, however, were lacking and the quills following these had not yet grown out to full length. The stronger females are especially distinguished in life from the weaker males by the larger bill. Colour of iris: dusky black-brown. Bill: anteriorly more or less extensive black, changing into yellowish or reddish-brown at the base; lower mandible often yellowish for the most part. Feet: pale dusky yellow-brown to vivid yellow-ochre; anterior side, especially ankles and toes, more or less washed with blackish-gray. 9 stomachs contained fragments of mussels and snail-shells (*Balanidæ* ? H.) in great numbers, some a felt-like, thread-like mass (*Algæ* ? R.), of mineral substances up to 0.34 g. of sand and small pebbles, of which the largest was 7.0×4.5×2.0 mm. (Rey.). Among the entrails of one specimen I found numerous flat-worms, which were examined by Veterinary Doctor Arnsdorff, through the kindly mediation of Prof. Dr. Braun, Director of the Zoological Museum in Königsberg, Prussia, and proved to be endoparasitic trematodes (p. 353) of the Family Monostomidæ, and indeed represent a new species, *Monostomum vicarium*. Many thanks also to the gentlemen mentioned from the ornithological side! Unfortunately, it is quite difficult to see collected objects which are taken by specialists for identification.

During the whole time of my stay near Killinek I kept under observation some small companies of the Purple Sandpiper, for the occurrence of which in Labrador, it is worthy of note that no certain proof exists since the time of Audubon (1833). Yet Kumlien mentions this species as common in Cumberland Sound (1879, p. 86), and the Marischal College Museum in Aberdeen has a skin collected there by Crawford Noble, Jr. (*in litt.*). The birds at Killinek generally

⁴⁴ *Gallinago delicata* (Ord) of A.O.U. Check-List, 1910. A. C. Bent in his "Life Histories of N. A. Shore Birds," Part I, 1927, p. 81, lists the American bird as *Capella gallinago delicata* (Ord), a subspecies of *C. g. gallinago* (L.) European Snipe. —R.M.A.

⁴⁵ Robert Ridgway, Birds of North and Middle America, Bull. U.S. Nat. Mus., No. 50, 1919, p. 230, revives the genus *Canutus* Brehm, Vög. Deutschl., 1831, p. 653, making the name of this species *Canutus canutus* (Linn.). The 18th Supplement of A.O.U. Check-List, *The Auk*, Vol. XL, 1923, p. 516, gives the name of the species as *Calidris canutus* (Linnaeus). —R.M.A.

keep quietly on rocky coasts, where they find for food small snails, mussels, crabs, and the like, on the rubble stone overgrown with sea-weed (*Fucus*). In comparison with the other sandpipers, they appear to be always less active, often remaining for hours among the same broken rocks, and do not creep out at last until a person comes within a few metres from them. Even then they often do not fly away unless fired upon, and trip about half anxiously, half curiously, to vanish suddenly again behind the stones. Occasionally a whole band stays together, although at times one can scarcely see any of the creatures. In spite of their slight shyness, they are not always easy to shoot at a suitable distance and to find afterwards. Often they seemed to me quite boorishly awkward, indeed clumsy in contrast with the other sandpipers. In their gray, unobtrusive, plumage they showed something plebeian and commonplace. The far from graceful shape of the feet causes a certain helplessness in moving on the land. At other times, indeed, the confiding, mysterious, little creatures touched me by their innocence in thinking to deceive us human beings by playing at concealment or by merely standing still. One does not hear their fine *Ti*, *Tüt*, *Tutit*, (Tullik ?) particularly often at this season of the year. Not until later in the autumn did I hear birds which were engaged in going farther utter a loud, comparatively deep-rolling *Tüüü* . . . or *Trrr* . . . with penetrating *ü*, which suits the robust form of the bird better than the high warning cry. At this time another, wilder mood comes over our phlegmatically inclined creatures, making them restless and active, and brings their strength and quickness of flight into play. The Eskimos shoot and eat this bird only now and then, in spite of the fact that it possesses exceptionally tender flesh and in the fall is also quite fat for the most part.

Actodromas maculata (Vieill.)⁴⁶ [p.353]
Gefleckter Strandläufer.—PECTORAL SANDPIPER.

Eskimo: *Siksariarpák*, *-pák*, *-pait* (*-pak* = a large one, that is to say, a large *Siksariak* [White-rumped Sandpiper]).

According to report of the Eskimos, not a rare migrant on the coasts and in the interior. Macoun calls the species common along the whole Atlantic coast southward from Cape Chidley, which belongs to our district (I, p. 159). Kumlien, on the other hand, does not mention it for Cumberland Sound. I met only once a flock of six individuals myself, namely on 30th August, near Kil-

linek and killed them. On the same day little flocks were observed at other places and some specimens shot from them.

8 skins of these in my collection, 7 females and 3 males, all young birds of the same year, not fully moulted, show the following measurements: Weight in the flesh: 45-55 g. (male 66 g.). Total length: 199-212 mm. (222). Spread of wing: 119-128 (134). Tail: 56-61.5 (62). Tail+wing: 2-4. Bill: 25.2-28 (28.5). Tarsi: 25-26.5 (27). Middle toe including the 5 mm. long claw: 25-26 mm. The male is also considerably stouter built than the female. Iris: dark gray-brown. Bill: on the distal half blackish; upper mandible at the base, dark red-brown; lower mandible, yellow-brown. Feet: anterior sides, greenish gray-yellow; posterior sides, and soles, yellowish.

4 stomachs showed the following contents: fine shreds of plants, apparently algae, in one a seed grain; of mineral substances, 0.05—0.35 g. sand and small pebbles, of which the largest measured 3.1×2.0×1.0 mm. (Rey).

The birds observed by me stayed at the time of the ebb-tide on a mossy and grassy flat in the inner part of a deep inlet of the sea, where a brook emptied. They were not at all shy. When two were shot, the others only flew frightened here and there over the place, at which time they uttered a short *Pschütt*, *pscht*, (much deeper than the high *Sit* of *A. fuscicollis*). They soon settled down in the grass again, tripped about excitedly with quick steps, in order to then flatten down suddenly on the ground. The other flocks were observed far from the sea on grassy banks of ponds.

Actodromas fuscicollis (Vieill.)⁴⁷ [p. 354]. *Bonaparte's Strandläufer*.—WHITE-RUMPED SANDPIPER.

Eskimo: *Siksariak*, *-ak*, *-at* (=sandpiper, from *siksak* = strand, and *-riak* = one, who walks; is used also of other related species.)

Most abundant sandpiper species on the coasts on the migration, rarer on edges of ponds in the interior; is said to occur much more rarely in spring than in the fall. Payne, Spreadborough, and Turner also found them in large numbers on the south coasts of Hudson Strait and Ungava Bay (Macoun, I, p. 160). Kumlien found them in Cumberland Sound; he believed that the birds breed there (1879, p. 86). Whether they do this in our district also is questionable; to begin with, nothing is known about it. (p. 355).

In the case of 32 skins of my collection, prepared by myself, namely, 4 male adults, 14 female adults, 6 male juveniles, and 8 female juveniles, from the period of 16th August to 29th September 1906, as well as some other birds examined in the flesh, the sexes and different ages show no characteristic differences in respect to their measure-

⁴⁶ *Pisobia maculata* (Vieillot) of A.O.U. Check-List, 1910. —R.M.A.

⁴⁷ *Pisobia fuscicollis* (Vieillot) of A.O.U. Check-List, 1910. —R.M.A.

ment: Weight in the flesh in the adult: 36-49.5 g.; in juveniles, 28.6-39.6 g. Total length: 171-188 mm. Spread of wing: 365-338. Wings: 114-125. Tail: 50-63. The tail usually exceeds the wing by some millimeters (measured up to 31 mm.), but many times recedes behind this as much as 10 mm. Bill: 22-25.5. Tarsi: 21-25. Middle toe including the 4-5 mm. long claw: 21-24 mm.

Iris: dark brown-black. Bill: dark brown-black, lower mandible at the base a little dark yellow- or reddish-brown. Feet: dull olive-blackish, greenish, reddish-gray, or blackish-brown. Tarsi: the lightest, toes and joints almost black; in juveniles, somewhat paler, dusky olive-brownish.

38 stomachs showed the following contents: In 34 cases small black pebbles and in some instances grains of quartz, pieces of feldspar, or sand; in one case fragments of mussels; in 4 cases more or less ground-up remains of beetles; in 1 case other insect remains; in 7 cases remains of fishes (scales, muscles); in 13 cases small black parts of snails; in 15 cases remains of small crustaceans (once of the family Gammaridae) (Rörig).

3 specimens of bird-lice (Mallophaga) which were parasites on the skin proved to be 2 females corresponding to *Colpocephalum uniforme* Kellogg, as well as 1 female approaching *Nirmus fissus* Nitzsch, yet showing a certain similarity to *N. holophæus* Nitzsch (T. Müller).⁴⁸

On 16th August, I observed the first small flocks of birds in the inner part of a bay. From that time until the end of the month such flocks were seen on all the larger excursions on the beach, and proved to be old birds. Their contour plumage was already moulting more or less into the winter plumage. It was a striking fact that I met old males only on 17th August, and a small flock apparently consisting only of the same, on 19th of this month, never again later. The sexes seem to like to travel separately, and the males start the fall migration, while the females which have brought up young remain behind with these a little longer in the breeding district. (p. 356). With the single exception of a single August specimen on the 24th of the month, I did not find young birds until 4th September and later. They were still accompanied by some old females; later, however, they seemed to travel alone. Among the 18 preparations of adult birds of my collection from the month of September, there is

only one specimen of the 10th; among the 14 young, on the other hand, outside of one of 24th August, these were only taken in September, the last on 29th of the month. With the most of these young birds, the bright red-brown back-colouring, prettily edged with white, was still showing; the gray winter dress was just beginning to show up sparingly with a number of them. I observed the last bird of this species on 2nd November at Hopedale.

The migration proceeds quite gradually, at least in such a beautiful autumn as 1906. The birds do not hurry with their advance and often remain for days in the same places. At high tide they like to ramble about, at low tide they hunt up the stretches of the shore. They prefer slimy flats, which are broken by little hummocks and streaks of water, the inner part of bays, as well as sandy beaches and flat strips of coast overgrown with seaweed on its stony and barren shores; but in a violent wind, like to seek shelter behind the heavy rock boulders on the beach. With the beginning of darkness, they fly very quickly around to their special sleeping places, though from the tent during the hours of the night I heard them hasten through the air, calling. I surprised the birds at their sleeping places several times. These were places where hardy grass grew among slimy, sandy flats and hummocks near the shore. When, towards evening it grew too dark for the work of preparing specimens in the tent, I liked to take my gun on my back and wander about a bit in the gathering twilight, while my Eskimo friend prepared the supper and the tea at the smoking fire. When he had everything ready and the tent arranged for the night, he called me back with a loud blast from a signal horn.

On such quiet, evening walks after the day's work was done, the exquisite peace and the sublime solitude of the landscape impressed me with fairy-like magic. Every little manifestation of life charmed one into attention. How enchanting it was then, when suddenly among the water pools near the beach, clearly mirroring the sky, one of the little birds drowsily tripped forth, bent down, ruffling up the plumage, shook itself, then stood still, gazed at me with surprise but scarcely with anxiety, and finally vanished among the plants. Many mysterious dialogues have I held with such a little creature and then made a wide detour in order not to disturb it in its rest.

Only in such sleeping places did I meet this sandpiper alone, otherwise always in closely-knit companies of (p. 357) 4 to 20 individuals. The birds run about on the sea-shore not very shyly for the most part, on stony terrain flying some-

⁴⁸ Dr. T. Müller, head teacher of Ebbing, West Prussia, had the kindness to examine most carefully the parasitic insects which I collected, and to identify them as far as the material allowed. There were 9 species of Mallophaga on 5 hosts. I also give him my best thanks once more for his trouble. When I was collecting on the bird mountains in Iceland in 1903, I was at times astonished at the numbers of Mallophaga and mites which many birds harboured, but at that time I had not arranged for their preparation, as I did at this time. I was so much more disappointed, to find some small creatures on only five bird species in spite of careful search. After the breeding season of the birds and as soon as the weather becomes cooler in late summer, most of the parasitic insects seem to die off.

meters, scatter a little, but always call each other together again with the oft-repeated *Sit, Silit, Zil, Püt, Pitepit*.

On longer flights this high, short call sounds somewhat sharp. It can be imitated rather easily with the mouth. I repeatedly lured some individuals to me in this way, so that after long, irresolute flying about, they settled down on the banks of ponds away from the beach. In such places they are met with only as an exception, even if the flocks not rarely are seen flying rather high across the country to go from one part of the sea to another. They almost always fly very low across the water. Their flight is quick, active, and graceful. On the whole, these little birds appear charming in every respect.

The Eskimos kill them at times for purposes of food, especially when many are sitting close together. If the hunter keeps quiet then, the unwounded members of the flock which has been shot at, do not usually leave the spot, but fly about here and there calling excitedly, and return to the wounded companions. But towards the birds of prey they are said to behave very warily. When wounded on the wing, they often swim for a short distance, but soon seek the land again.

Limonites minutilla (Vieill.).⁴⁸ [p. 357].
Kleiner amerikanischer Strandläufer.—LEAST SANDPIPER.

Eskimo: *Sullaijok, -jåk, -jut* (partim; according to v. Schubert from *sullinek* = busy, thus, "the busy one," because always running about hunting food).

Apparently not particularly common migrant in our district, which may be too rocky and barren for this bird, at least in its northern part. Whether single pairs breed in favourable places has not been established up to the present. Farther in the south they may breed more frequently. Turner found the species at the mouth of the Koksoak, Ungava Bay, apparently breeding (1886, p. 247), and Macoun asserts this for the whole of eastern and northern Labrador (I, p. 162). Bigelow, indeed, says the bird breeds commonly along the eastern Labrador coast (1902, p. 28), but this informant calls all birds "common" that are not quite rare. One has to look quite sceptically upon all the records about eggs of this species, especially in respect to some confusion with *Ereunetes pusillus*. I collected no bird of this species, and Kumlien also mentions it only briefly as observed in September, 1877, in Cumberland Sound (1879, p. 86).

Ereunetes pusillus pusillus (L.) [p. 357].
Ostlicher amerikanischer Zwerg-Strandläufer.—SEMPALMATED SANDPIPER.

Eskimo: *Sullaijok (Sullajok), -jåk, -jut* (partim). [p. 358].

Not rare migrant, and according to all appearances a breeding bird now and then in our district. Different collections claim to possess eggs of the species from Labrador. However, confusions, especially with *Limonites minutilla*, are not precluded here. Turner believes that this species breeds in the district at the mouth of the Koksoak, in Ungava Bay, even if it was only rarely met with in that place (1886, p. 247). Bigelow claims to have found the downy young of the bird on Seal Island on the east coast of Labrador (1902, p. 28)⁴⁹.

I secured three young birds myself, just moulted, all males, on 18th August, 7th September, and 10th September, in different localities on Ungava Bay and on the Atlantic coast.

The measurements are as follows: Weight⁷ in the flesh: 25-34 g. (latter bird very fat). Total length: 144-157 mm. Spread of wing: 290-309. Wing: 90-96. Tail: 40-43. Tail + wing: 2-6. Bill: 19.5-22. Tarsi: 21.5-22. Middle toe including the 3 mm. long claw: 18-20 mm. Iris: dark brown. Bill: black, smooth; much narrower than in old birds. Feet: dusky olive-greenish, tarsi the brightest. The stomachs in each case contained fine sand, little pebbles, whitish powder of indefinite origin, small black snails (Rörig).

All three times I met three birds together, and suspect that they were siblings (*Geschwister*)⁵⁰, which at least in the first case had been hatched at no very great distance. That the old birds desert the young which have become independent, and fly away ahead of them, one notes indeed in different species of sandpipers. These exceedingly graceful, light-footed and light-

⁴⁹ According to the notes most kindly made for me by Dr. O. Ottosson, the eminent oölogist, in Strömsholm, Sweden, certain eggs in one clutch each of *Ereunetes pusillus pusillus* and *Limonites minutilla* of his collection show quite a different type. The first resemble large eggs of *Limonites minuta* (Leisl.) or small ones of *Pelidna alpina* (L.), the latter resemble large eggs of *Limonites temmincki* (Leisl.).

E. pusillus: Ground-colour gray-yellowish, with superficial leather-brown and deeper ash-gray to gray-violet spots; shape elongated, beautifully pear-shaped; luster rather strong; spiral marking very distinct.

L. minutilla: Ground-colour light-gray sand-colour, with superficial red-brown and deeper ash-gray and violet spots; shape compact scarcely or not at all pear-shaped; luster very faint; no spiral marking.

The alleged genuine eggs likewise of both species in the Royal Zoological Museum in Dresden do not indeed show clearly the differences mentioned. Authentic material is very difficult to secure and perhaps is present in very few collections.

⁵⁰ "Sibling," a new word coined by American anthropologists and coming into general use in their literature, seems to be equally needed by zoologists. It is equivalent to the German word "Geschwister," and combines the meanings of both "brother" and "sister"; that is to say, it denotes common parentage without making any distinction in regard to sex. In this case, it means birds of the same brood.—R.M.A.

⁴⁸ *Pisobia minutilla* (Vieillot) of A.O.U. Check-List, 1910.—R.M.A.

winged birds kept themselves concealed on moor-like, grass-bordered water surfaces near the shore and were not shy (p. 359). After a shot, however, the unwounded birds flew away without returning. Their short twittering *Bib, Bibib*, was heard at the same time.

Calidris arenaria (L.)⁵¹. [p. 359].—*Sanderling*.—SANDERLING.

Rather rare migrant in our district, entirely unknown to the natives in spite of its characteristic colouring and lack of shyness. I met only one single adult female, on 19th August, on the rocky shore in northeast of Ungava Bay, and killed it. Bigelow also calls the species rather rare in northeastern Labrador (1902, p. 28). According to Turner's record, two were collected at the mouth of the Koksoak (1886, p. 247). Missionary Perrett, to his knowledge, never had the bird in his possession at all. Kumlien saw a small flock only once, in September, 1877, in Cumberland Sound, without being able to collect a specimen from it (1879, p. 87).

The bird mentioned in my collection shows the following measurements: Weight in the flesh: 62 g. Total length: 193 mm. Spread of wing: 390. Wing: 126. Tail: 62. Tail=wing [*i.e.*, tip of wing comes to tip of tail]. Bill: 26. Tarsi: 25. Middle toe including the 3 mm. long claw: 18 mm. Iris: dull brown-black. Bill: dark-brown-black. Feet: very dusky olive-green, toes darkest. The stomach contained the remains of small crustaceans (Rörig).

Totanus melanoleucus (Gm.) [p. 359]. *Grosser Gelbschenkel*.—GREATER YELLOW-LEGS.

Eskimo: *Nioluk*, -*lák*, -*luit* (=the large-boned one), also *Kanaige*, -*gik*, -*git* (from *kannák*=leg or *kannák*=tent pole, on account of the long legs).

Not common migrant, and not observed at all by me. But Missionary Perrett knows it very well and for the districts farther south notes it as common in many years. Macoun, too, also on the basis of his data, not always authentic to be sure, calls it a common bird on the spring and fall migrations along the whole Atlantic coast (I, p. 171). Bigelow met a few individuals in September, 1900, at Port Manvers (1902, p. 29). Turner calls the species not common in the Ungava district; he collected some fall birds at the mouth of the Koksoak (1886, p. 247). Kumlien secured a single specimen on 14th September 1877, in Cumberland Sound (1879, p. 88).

Tryngites subruficollis (Vieill.) [p. 359]. *Kurzschnäbliger Uferläufer*.—BUFF-BREAST-ED SANDPIPER.

Robert Bell claims to have secured this species in one specimen on 23th September, 1884, at Killinek (Port Burwell), and Townsend and Allen acknowledge this occurrence as correct (p. 360), apparently according to information about it from J. Macoun, and also the record of Coues, that on 20th August, 1860, a specimen of the species was collected at Henley Harbour (1907, p. 352). The identity of the Bell skin does not seem to be quite without objection, since unfortunately in the same work there are also mistakes in identification in the case of the alleged occurrence of *Puffinus tenuirostris*, *Olor buccinator*, and *Heteractitis incanus*, as Townsend and Allen explain (*l. c.*). The species is more western American, and in the northeast of the continent not known with certainty farther than up to Repulse Bay (Cat. Birds Brit. Mus., XXIV 1896, p. 624). After all, an occasional occurrence in our district of these agile-winged birds, which have so often been collected in England, is not very wonderful.

Tringoides macularius (L.)⁵². [p. 360]. *Drossel-Uferläufer*.—SPOTTED SANDPIPER.

Eskimo: *Sullaijok*, -*jük*, -*jut* (*partim*), also *Aivigiak*, -*giük*, -*giut* (etymology not clear); the names for the smaller species of sandpipers are often applied without certainty and interchangeably.

Occasional visitor of our district, but apparently no longer a breeding bird there, or at the most very sporadically in the more favourable southern parts. No specimen came into my sight. In the rest of Labrador it is said to breed more or less commonly, northward as far as southern Ungava Bay (Macoun, I, p. 180). On the other hand, Kumlien does not even mention the species for Baffin Island.

Numenius hudsonicus Lath. [p. 360]. *Hudsonischer Brachvogel*.—HUDSONIAN CURLEW.

Eskim: *Akpingek*, -*ik*, -*it* (*partim*); according to G. H. von Schubert's informant, because the birds like to eat the fruits of the Polar blackberry (*Rubus arcticus* L., and probably also *Rubus Chamæmorus* L.), the Eskimo *akpik*, a thing which is quite credible.

Not common migrant in the late summer, but is said to appear annually in small flocks, and often also in rather large flocks; it is not determined, indeed, whether it is always a case of the species or of the following species. Chapman maintains, to be sure, that *Numenius hudsonicus* appears far more abundantly than the following species on the Atlantic coast (1906, p. 170), yet I have not found positive records of its occurrence

⁵¹ *Calidris leucophaea* (Pallas) in A.O.U. Check-List, 1910, but later changed to *Crocethia alba* (Pallas) in 17th Supplement to Check-List, 1920.—R.M.A.

⁵² *Actitis macularia* (Linnaeus) of A.O.U. Check-List, 1910.—R.M.A.

in districts which are neighbours of ours. Turner says, to be sure, that he saw three specimens at the mouth of the Koksoak in September, 1882 (1886, p. 248), and Weiz mentions the species also for northeastern Labrador (G. Neumeyer, Intern. Polarforschung I, 1891, Appendix, p. 100). Others follow them in the determination; authenticating specimens nevertheless do not appear to have been in hand. (p. 361).

From the end of August to 18th September curlews were observed repeatedly at Killinek, but not one of the very shy, restless creatures, which are hard to recognize on the ground, was taken. According to exact descriptions of specimens collected there earlier by Mr. J. Lane, I considered the birds as belonging mostly to the above species. This view was strengthened, when towards evening on 30th August, I heard the long-drawn-out, trilling *Bibibibüü* of curlews, which reminded me instantly of *Numenius phæopus* [Whimbrel]. My two Eskimo companions also knew the voice as that of the *Akpingek*, without separating the two species, to be sure. At different times we heard the tones which came from the mountainous interior; our search, however, remained without success. G. H. Mackay states in his detailed biological descriptions of *Numenius borealis*, that he has never heard other notes than short ones, cries very similar to the voice of *Sterna hirundo* (Auk, IX, 1892, pp. 16-21). The trilling of *Numenius hudsonicus* is known, however.

Numenius borealis (Forst.). [p. 361].
Eskimo-Brachvogel.—ESKIMO CURLEW.

Eskimo: *Akpingek*, -ik, -it (*partim*).

This curlew is mentioned by different authors as migrant in districts which are neighbours to ours. Yet because of the lack of skin-material the species has not always been determined with

certainty. Chapman writes, that *N. borealis* visits the interior of the country more frequently than the Atlantic coast (1906, p. 171). Other informants refer their observations on curlews, not always unobjectionable, to this species. Turner observed large flocks over the mouth of the Koksoak in Ungava Bay; Spreadborough, on the other hand, saw no specimen on his ornithological journey to that place nor in the rest of Labrador in July, 1896 (Macoun, I, p. 183). Bigelow states that in former times the species appeared in great numbers on the Labrador coast, but at the present time appears only in exceedingly small numbers. In the fall of 1900 he saw only five specimens on the coast himself and did not hear of any others (1902, p. 29). Others also try to show, that the curlews migrating through Labrador are diminishing in numbers considerably and constantly. Townsend and Allen carefully compile the references about this (1907, p. 354 f.). On the other hand, the apparently well-informed Labrador informant of G. H. von Schubert writes explicitly: "They come as migrating birds in autumn, yet they are not seen in all years" (*Gelehrte Anzeigen, Bull. bayer. Akad. Wiss.*, 1844, p. 427). The reasons for an actual diminishing in numbers are just as unknown to us as the reasons for the extinction of the Labrador Duck, *Camptolaimus labradorius* (Gm.). In this case it is perhaps (p. 362) only a matter of changes in migration. Or should years of completely unfavourable weather have so thinned the number of the birds? Kumlien calls *N. borealis* a species well known to the Eskimos of Cumberland Sound, but himself saw only a small flock that passed Kingua Fiord northward in June, 1878; one specimen from it was killed (1879, p. 88). In Greenland both species have occurred (H. Winge, Grönlands Fugle, 1898, p. 159).

(To be continued.)

ERATUM—In article on Mammal Fluctuations, *Canadian Field Naturalist*, xlii, 8, Nov. 1928, p. 190, for "produced 33 families of young," read "13 families."—R. M. ANDERSON.

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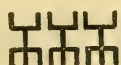
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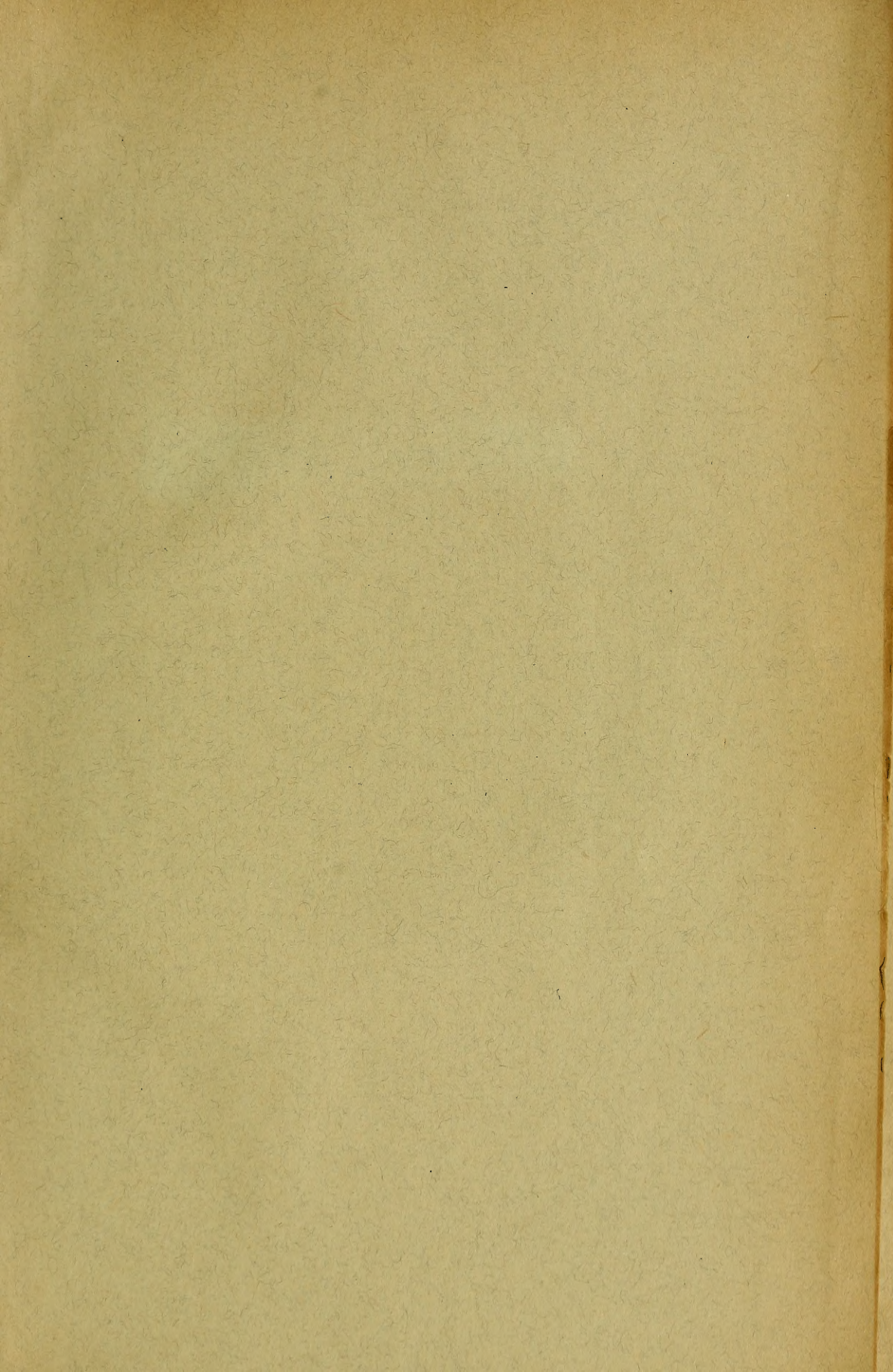
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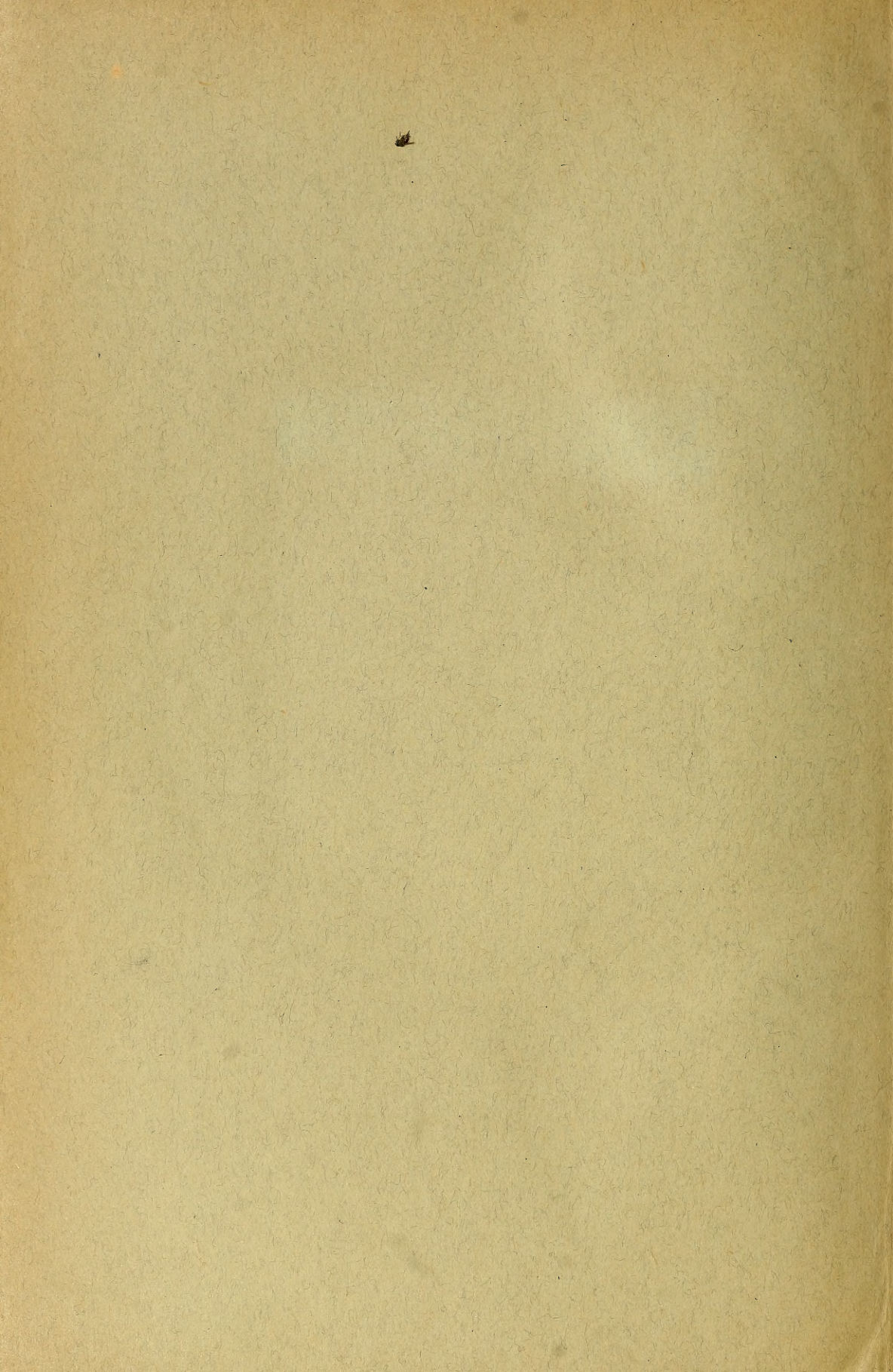
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